FCC Test Report

(PART 27)

Report No.: RF191231C03-5

FCC ID: UK7-C1N

Test Model: C1NF1

Received Date: Dec. 31, 2019

Test Date: Jan. 09, 2020 ~ Mar. 11, 2020

Issued Date: Jul. 07, 2020

Applicant: Fossil Group, Inc.

Address: 901 S. Central Expy, Richardson, Texas, United States, 75080

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location (1): No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan

Test Location (2): B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan

FCC Registration / Designation Number: 788550 / TW0003
427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF191231C03-5	Original Release	Jul. 07, 2020

1 Certificate of Conformity

Product: Smart Watch

Brand: FOSSIL

Test Model: C1NF1

Sample Status: Identical Prototype

Applicant: Fossil Group, Inc.

Test Date: Jan. 09, 2020 ~ Mar. 11, 2020

Standards: FCC Part 27, Subpart C, H, F, L

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Lena Wang , **Date:** Jul. 07, 2020

Lena Wang / Specialist

Approved by : , **Date:** Jul. 07, 2020

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(d)(4)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -21.61 dB at 6930.00 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 12)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(c)(10)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
---	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(g)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(g)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(g)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -27.95 dB at 149.61 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 13)			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(b)(10)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
---	Peak to Average Ratio	Pass	Meet the requirement of limit.
27.53(c)(2)(4)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(c)(2)&(f)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(c)(2)&(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -18.90 dB at 1564.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.0400 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 26, 2019	Aug. 25, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jul. 17, 2019	Jul. 16, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSW43	101582	Mar. 31, 2020	Mar. 30, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 08, 2019	Oct. 07, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 12, 2019	Nov. 11, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-631	Nov. 12, 2019	Nov. 11, 2020
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna ETS	3117	00155510	Nov. 24, 2019	Nov. 23, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2019	Apr. 16, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2019	Nov. 24, 2020
Preamplifier Agilent	310N	187226	Jun. 18, 2019	Jun. 17, 2020
Preamplifier Agilent	83017A	MY39501357	Jun. 18, 2019	Jun. 17, 2020
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 18, 2019	Jun. 17, 2020
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 18, 2019	Jun. 17, 2020
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 19, 2019	Aug. 18, 2021
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 10, 2019	Sep. 09, 2020
DC power supply Keysight	U8002A	MY56330015	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 27, 2019	Jun. 26, 2020

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HsinTien Chamber 1.

3 General Information

3.1 General Description of EUT

Product	Smart Watch	
Brand	FOSSIL	
Test Model	C1NF1	
Status of EUT	Identical Prototype	
Power Supply Rating	5.0 Vdc (adapter or host equipment) 3.85-4.4 Vdc (Li-ion battery)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1747.5 MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	699.7 ~ 715.3 MHz
	LTE Band 12 (Channel Bandwidth: 3 MHz)	700.5 ~ 714.5 MHz
	LTE Band 12 (Channel Bandwidth: 5 MHz)	701.5 ~ 713.5 MHz
	LTE Band 12 (Channel Bandwidth: 10 MHz)	704.0 ~ 711.0 MHz
	LTE Band 13 (Channel Bandwidth: 5 MHz)	779.5 ~ 784.5 MHz
	LTE Band 13 (Channel Bandwidth: 10 MHz)	782.0 MHz
Emission Designator	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M10D7W
	LTE Band 4 (Channel Bandwidth: 3 MHz)	2M72G7D
	LTE Band 4 (Channel Bandwidth: 5 MHz)	4M49D7W
	LTE Band 4 (Channel Bandwidth: 10 MHz)	8M95G7D
	LTE Band 4 (Channel Bandwidth: 15 MHz)	13M4G7D
	LTE Band 4 (Channel Bandwidth: 20 MHz)	17M9G7D
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE Band 12 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 12 (Channel Bandwidth: 5 MHz)	4M50D7W
	LTE Band 12 (Channel Bandwidth: 10 MHz)	8M99G7D
	LTE Band 13 (Channel Bandwidth: 5 MHz)	4M50D7W
	LTE Band 13 (Channel Bandwidth: 10 MHz)	8M95G7D
Max. ERP Power	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	10.14 mW
	LTE Band 12 (Channel Bandwidth: 3 MHz)	10.23 mW
	LTE Band 12 (Channel Bandwidth: 5 MHz)	10.33 mW
	LTE Band 12 (Channel Bandwidth: 10 MHz)	10.42 mW
	LTE Band 13 (Channel Bandwidth: 5 MHz)	13.56 mW
	LTE Band 13 (Channel Bandwidth: 10 MHz)	13.67 mW
Max. EIRP Power	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	50.06 mW
	LTE Band 4 (Channel Bandwidth: 3 MHz)	50.52 mW
	LTE Band 4 (Channel Bandwidth: 5 MHz)	50.87 mW
	LTE Band 4 (Channel Bandwidth: 10 MHz)	51.35 mW
	LTE Band 4 (Channel Bandwidth: 15 MHz)	51.82 mW
	LTE Band 4 (Channel Bandwidth: 20 MHz)	52.30 mW
Antenna Type	Loop Antenna	
Antenna Gain	LTE Band 4	-6.87 dBi

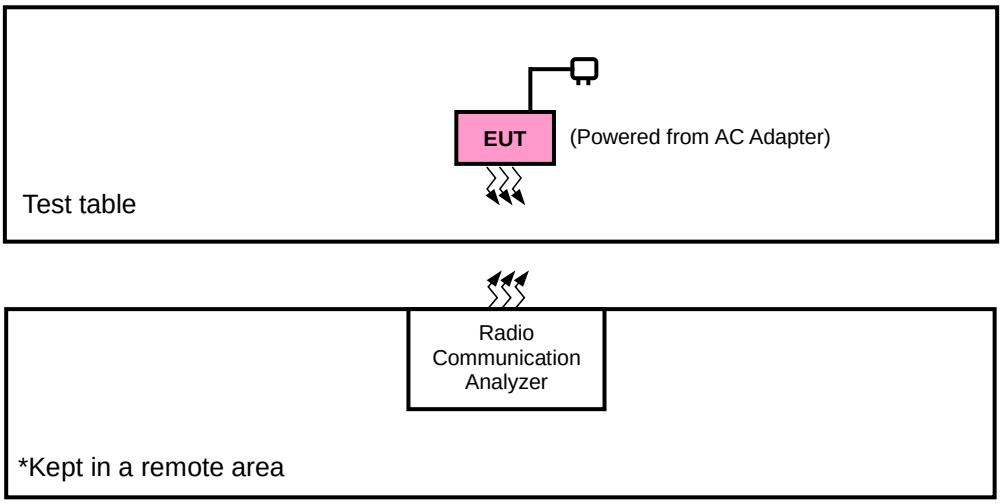
	LTE Band 12	-11.71 dBi
	LTE Band 13	-10.57 dBi
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
2. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
3. The module doesn’t support 10M-16QAM, 15M-16QAM, 20M-16QAM. 16QAM only supports up to 5M-25RB.

3.2 Configuration of System under Test

<Radiated Emission Test> & <E.R.P. / E.I.R.P. Test>



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Adapter	ASUS	AD827M	N/A	N/A
2.	Radio Communication Analyzer	Anritsu	MT8820C	6201300640	N/A

No.	Signal Cable Description Of The Above Support Units
1.	1m shielded cable

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	ERP / EIRP	Radiated Emission
LTE Band 4	Z-plane	X-plane
LTE Band 12	X-plane	X-plane
LTE Band 13	X-plane	X-plane

LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	20050 to 20300	20175	20MHz	QPSK	100 RB / 0 RB Offset
				5 MHz	16QAM	25 RB / 0 RB Offset
-	Frequency Stability	19957 to 20393	19957, 20393	1.4 MHz	QPSK	6 RB / 0 RB Offset
		19965 to 20385	19965, 20385	3 MHz	QPSK	15 RB / 0 RB Offset
		19975 to 20375	19975, 20375	5 MHz	QPSK	25 RB / 0 RB Offset
		20000 to 20350	20000, 20350	10 MHz	QPSK	50 RB / 0 RB Offset
		20025 to 20325	20025, 20325	15 MHz	QPSK	75 RB / 0 RB Offset
		20050 to 20300	20050, 20300	20 MHz	QPSK	100 RB / 0 RB Offset
-	Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	50 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	75 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	100 RB / 0 RB Offset
-	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	1 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Band Edge	19957 to 20393	19957	1.4 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20393	1.4 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		19965 to 20385	19965	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			20385	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		19975 to 20375	19975	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			20375	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		20000 to 20350	20000	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			20350	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
		20025 to 20325	20025	15 MHz	QPSK	1 RB / 0 RB Offset
						75 RB / 0 RB Offset
			20325	15 MHz	QPSK	1 RB / 74 RB Offset
						75 RB / 0 RB Offset
		20050 to 20300	20050	20 MHz	QPSK	1 RB / 0 RB Offset
						100 RB / 0 RB Offset
			20300	20 MHz	QPSK	1 RB / 99 RB Offset
						100 RB / 0 RB Offset
-	Conducted Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	1 RB / 0 RB Offset
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	1 RB / 0 RB Offset
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1 RB / 0 RB Offset
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only EIRP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

LTE Band 12

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	23060 to 23130	23095	10 MHz	QPSK	50 RB / 0 RB Offset
				5 MHz	16QAM	25 RB / 0 RB Offset
-	Frequency Stability	23017 to 23173	23017, 23173	1.4 MHz	QPSK	6 RB / 0 RB Offset
		23025 to 23165	23025, 23165	3 MHz	QPSK	15 RB / 0 RB Offset
		23035 to 23155	23035, 23155	5 MHz	QPSK	25 RB / 0 RB Offset
		23060 to 23130	23060, 23130	10 MHz	QPSK	50 RB / 0 RB Offset
-	Occupied Bandwidth	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	50 RB / 0 RB Offset
-	Peak to Average Ratio	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	1 RB / 0 RB Offset
-	Band Edge	23017 to 23173	23017	1.4 MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			23173	1.4 MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		23025 to 23165	23025	3 MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			23165	3 MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		23035 to 23155	23035	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23155	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23060 to 23130	23060	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23130	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK	1 RB / 0 RB Offset
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK	1 RB / 7 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK	1 RB / 0 RB Offset
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK	1 RB / 0 RB Offset
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only ERP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	23230	23230	10 MHz	QPSK	50 RB / 0 RB Offset
				5 MHz	16QAM	25 RB / 0 RB Offset
-	Frequency Stability	23205 to 23255	23205, 23255	5 MHz	QPSK	25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	50 RB / 0 RB Offset
-	Occupied Bandwidth	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	50 RB / 0 RB Offset
-	Peak to Average Ratio	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
-	Band Edge	23205 to 23255	23205	5 MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			23255	5 MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			23230	10 MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	Conducted Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1 RB / 0 RB Offset
		23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only ERP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP / EIRP	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Modulation Characteristics	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Frequency Stability	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Occupied Bandwidth	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Band Edge	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Peak to Average Ratio	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Conducted Emission	25 deg. C, 65 % RH	3.85 Vdc	Gavin Wu
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 General Description of Applied Standards and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:
FCC 47 CFR Part 2
FCC 47 CFR Part 27
ANSI 63.26-2015

Note: All test items have been performed and recorded as per the above standards.

References Test Guidance:
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016

Note: All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

Portable stations (hand-held devices) operating in the 746-757 MHz, 776-788 MHz and 805-806 MHz band are limited to 3 watts ERP

Portable stations (hand-held device) operating in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

4.1.2 Test Procedures

EIRP / ERP Measurement:

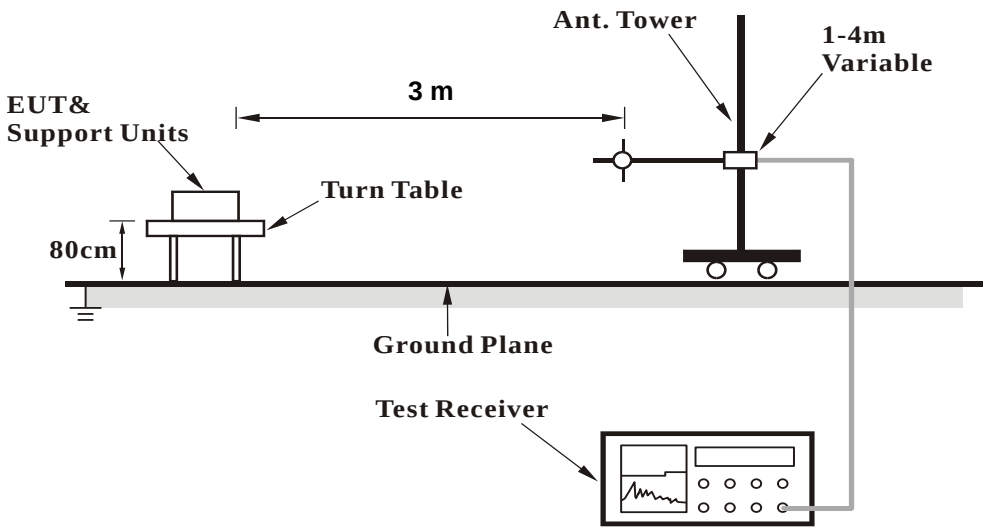
a. All measurements were done at low, middle and high operational frequency range. RBW is 10 MHz、15 MHz、20 MHz for LTE mode, and VBW ≥ 3 x RBW.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G.
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

Conducted Power Measurement:

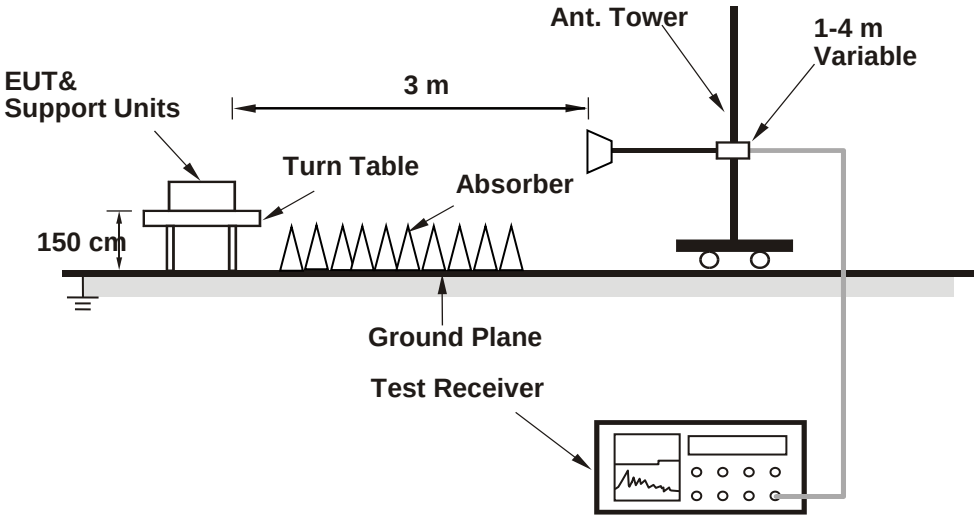
a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

EIRP / ERP Measurement:
<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 4

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20050	20175	20300	
		Frequency (MHz)		1720.0	1732.5	1745.0	
20M	QPSK	1	0	24.72	24.95	24.82	0
		1	50	24.39	24.60	24.49	0
		1	99	24.44	24.65	24.54	0
		50	0	23.38	23.59	23.48	1
		50	25	23.38	23.58	23.47	1
		50	50	23.04	23.25	23.14	1
		100	0	23.29	23.50	23.39	1

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20025	20175	20325	
		Frequency (MHz)		1717.5	1732.5	1747.5	
15M	QPSK	1	0	24.69	24.85	24.73	0
		1	37	24.37	24.52	24.42	0
		1	74	24.40	24.55	24.44	0
		36	0	23.31	23.55	23.40	1
		36	19	23.31	23.58	23.47	1
		36	39	22.98	23.22	23.09	1
		75	0	23.21	23.46	23.32	1

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20000	20175	20350	
		Frequency (MHz)		1715.0	1732.5	1750.0	
10M	QPSK	1	0	24.58	24.79	24.79	0
		1	24	24.21	24.45	24.35	0
		1	49	24.27	24.54	24.36	0
		25	0	23.28	23.53	23.40	1
		25	12	23.30	23.44	23.34	1
		25	25	22.98	23.17	22.97	1
		50	0	23.11	23.36	23.36	1
	16QAM	1	0	-	-	-	-
		1	24	-	-	-	-
		1	49	-	-	-	-
		25	0	-	-	-	-
		25	12	-	-	-	-
		25	25	-	-	-	-
		50	0	-	-	-	-

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19975	20175	20375	
		Frequency (MHz)		1712.5	1732.5	1752.5	
5M	QPSK	1	0	24.64	24.84	24.69	0
		1	12	24.27	24.36	24.30	0
		1	24	24.43	24.60	24.38	0
		12	0	23.22	23.41	23.39	1
		12	6	23.35	23.42	23.36	1
		12	13	22.89	23.23	22.97	1
		25	0	23.17	23.29	23.21	1
	16QAM	1	0	23.73	23.66	23.78	1
		1	12	23.81	23.75	23.85	1
		1	24	23.53	23.47	23.57	1
		12	0	22.71	22.65	22.75	2
		12	6	22.59	22.53	22.63	2
		12	13	22.51	22.45	22.55	2
		25	0	22.90	22.97	22.95	2

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19965	20175	20385	
		Frequency (MHz)		1711.5	1732.5	1753.5	
3M	QPSK	1	0	24.51	24.86	24.67	0
		1	7	24.23	24.38	24.28	0
		1	14	24.29	24.49	24.33	0
		8	0	23.19	23.51	23.29	1
		8	3	23.21	23.46	23.35	1
		8	7	22.98	23.12	23.00	1
		15	0	23.09	23.39	23.29	1
	16QAM	1	0	23.60	23.45	23.64	1
		1	7	23.78	23.65	23.70	1
		1	14	23.35	23.32	23.42	1
		8	0	22.65	22.57	22.58	2
		8	3	22.43	22.32	22.59	2
		8	7	22.41	22.41	22.38	2
		15	0	22.80	22.83	22.71	2

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19957	20175	20393	
		Frequency (MHz)		1710.7	1732.5	1754.3	
1.4M	QPSK	1	0	24.59	24.75	24.76	0
		1	2	24.35	24.47	24.43	0
		1	5	24.28	24.54	24.52	0
		3	0	24.26	24.46	24.43	0
		3	1	24.26	24.44	24.35	0
		3	3	23.92	24.04	24.05	0
		6	0	23.17	23.47	23.25	1
	16QAM	1	0	23.52	23.52	23.55	1
		1	2	23.77	23.62	23.71	1
		1	5	23.40	23.28	23.50	1
		3	0	23.56	23.62	23.57	1
		3	1	23.56	23.44	23.51	1
		3	3	23.41	23.33	23.34	1
		6	0	22.73	22.80	22.89	2

LTE Band 12

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23060	23095	23130				Channel		23035	23095	23155	
		Frequency (MHz)		704.0	707.5	711.0				Frequency (MHz)		701.5	707.5	713.5	
10M	QPSK	1	0	24.11	24.26	24.66	0	5M	QPSK	1	0	23.99	24.12	24.43	0
		1	24	24.04	24.18	24.55	0			1	12	23.96	23.97	24.32	0
		1	49	23.91	24.05	24.42	0			1	24	23.67	23.91	24.19	0
		25	0	23.16	23.30	23.67	1			12	0	23.14	23.15	23.57	1
		25	12	22.99	23.13	23.50	1			12	6	22.85	23.02	23.33	1
		25	25	23.00	23.14	23.51	1			12	13	22.95	23.02	23.28	1
		50	0	23.20	23.34	23.71	1			25	0	23.11	23.30	23.50	1
	16QAM	1	0	-	-	-	-		16QAM	1	0	22.33	22.97	22.18	1
		1	24	-	-	-	-			1	12	22.16	22.81	22.06	1
		1	49	-	-	-	-			1	24	22.03	22.64	22.09	1
		25	0	-	-	-	-			12	0	21.61	22.26	21.51	2
		25	12	-	-	-	-			12	6	21.58	22.23	21.48	2
		25	25	-	-	-	-			12	13	21.56	22.21	21.46	2
		50	0	-	-	-	-			25	0	21.48	22.13	21.38	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23025	23095	23165				Channel		23017	23095	23173	
		Frequency (MHz)		700.5	707.5	714.5				Frequency (MHz)		699.7	707.5	715.3	
3M	QPSK	1	0	23.93	24.18	24.47	0	1.4M	QPSK	1	0	23.96	24.09	24.61	0
		1	7	23.95	24.06	24.50	0			1	2	23.88	24.07	24.40	0
		1	14	23.86	23.98	24.22	0			1	5	23.77	24.04	24.26	0
		8	0	23.08	23.22	23.55	1			3	0	24.01	24.14	24.55	0
		8	3	22.76	23.00	23.30	1			3	1	23.79	23.98	24.39	0
		8	7	22.88	22.98	23.32	1			3	3	23.90	24.08	24.27	0
		15	0	23.18	23.26	23.50	1			6	0	23.00	23.22	23.58	1
	16QAM	1	0	22.22	22.84	22.14	1		16QAM	1	0	22.27	22.87	22.07	1
		1	7	22.12	22.73	22.08	1			1	2	22.13	22.71	22.15	1
		1	14	22.12	22.55	22.15	1			1	5	22.19	22.52	22.07	1
		8	0	21.45	22.10	21.43	2			3	0	22.40	23.01	22.38	1
		8	3	21.55	22.01	21.38	2			3	1	22.46	23.14	22.24	1
		8	7	21.54	22.04	21.31	2			3	3	22.36	23.08	22.31	1
		15	0	21.36	21.99	21.34	2			6	0	21.31	21.98	21.25	2

LTE Band 13

BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel			23230					Channel		23205	23230	23255	
		Frequency (MHz)			782.0					Frequency (MHz)		779.5	782.0	784.5	
10M	QPSK	1	0	-	24.77	-	0	5M	QPSK	1	0	24.57	24.59	24.55	0
		1	24	-	24.5	-	0			1	12	24.28	24.30	24.26	0
		1	49	-	24.44	-	0			1	24	24.29	24.31	24.27	0
		25	0	-	23.6	-	1			12	0	23.48	23.50	23.46	1
		25	12	-	23.46	-	1			12	6	23.25	23.27	23.23	1
		25	25	-	23.41	-	1			12	13	23.20	23.22	23.18	1
		50	0	-	23.4	-	1			25	0	23.32	23.34	23.30	1
	16QAM	1	0	-	-	-	-		16QAM	1	0	23.00	23.02	22.98	1
		1	24	-	-	-	-			1	12	22.84	22.86	22.82	1
		1	49	-	-	-	-			1	24	22.60	22.62	22.58	1
		25	0	-	-	-	-			12	0	22.15	22.17	22.13	2
		25	12	-	-	-	-			12	6	21.98	22.00	21.96	2
		25	25	-	-	-	-			12	13	21.91	21.93	21.89	2
		50	0	-	-	-	-			25	0	22.15	22.17	22.13	2

ERP Power (dBm)

LTE Band 12							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23017	699.7	-20.51	32.719	10.06	10.14	H
	23095	707.5	-20.57	32.736	10.02	10.04	
	23173	715.3	-20.48	32.591	9.96	9.91	
	23017	699.7	-21.31	32.69	9.23	8.38	V
	23095	707.5	-21.49	32.81	9.17	8.26	
	23173	715.3	-21.50	32.74	9.09	8.11	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	23017	699.7	-21.51	32.719	9.06	8.05	H
	23095	707.5	-21.57	32.736	9.02	7.97	
	23173	715.3	-21.48	32.591	8.96	7.87	
	23017	699.7	-22.31	32.69	8.23	6.65	V
	23095	707.5	-22.49	32.81	8.17	6.56	
	23173	715.3	-22.50	32.74	8.09	6.44	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 12							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23025	700.5	-20.47	32.719	10.10	10.23	H
	23095	707.5	-20.53	32.736	10.06	10.13	
	23165	714.5	-20.44	32.591	10.00	10.00	
	23025	700.5	-21.27	32.69	9.27	8.45	V
	23095	707.5	-21.45	32.81	9.21	8.34	
	23165	714.5	-21.46	32.74	9.13	8.18	
Channel Bandwidth: 3 MHz / 16QAM							
X	23025	700.5	-21.47	32.719	9.10	8.13	H
	23095	707.5	-21.54	32.736	9.05	8.03	
	23165	714.5	-21.44	32.591	9.00	7.95	
	23025	700.5	-22.27	32.69	8.27	6.71	V
	23095	707.5	-22.45	32.81	8.21	6.62	
	23165	714.5	-22.47	32.74	8.12	6.49	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 12							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23035	701.5	-20.43	32.719	10.14	10.33	H
	23095	707.5	-20.49	32.736	10.10	10.22	
	23155	713.5	-20.40	32.591	10.04	10.09	
	23035	701.5	-21.24	32.69	9.30	8.51	V
	23095	707.5	-21.42	32.81	9.24	8.39	
	23155	713.5	-21.42	32.74	9.17	8.26	
Channel Bandwidth: 5 MHz / 16QAM							
X	23035	701.5	-21.44	32.719	9.13	8.18	H
	23095	707.5	-21.50	32.736	9.09	8.10	
	23155	713.5	-21.40	32.591	9.04	8.02	
	23035	701.5	-22.25	32.69	8.29	6.75	V
	23095	707.5	-22.42	32.81	8.24	6.67	
	23155	713.5	-22.43	32.74	8.16	6.55	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 12							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23060	704.0	-20.40	32.727	10.18	10.42	H
	23095	707.5	-20.45	32.739	10.14	10.33	
	23130	711.0	-20.50	32.728	10.08	10.18	
	23060	704.0	-21.26	32.75	9.34	8.59	V
	23095	707.5	-21.38	32.81	9.28	8.47	
	23130	711.0	-21.48	32.84	9.21	8.34	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 13							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23205	779.5	-19.34	32.771	11.28	13.43	H
	23230	782.0	-19.27	32.741	11.32	13.56	
	23255	784.5	-19.52	32.854	11.18	13.13	
	23205	779.5	-21.18	32.5	9.17	8.26	V
	23230	782.0	-21.13	32.52	9.24	8.39	
	23255	784.5	-21.36	32.62	9.11	8.15	
Channel Bandwidth: 5 MHz / 16QAM							
X	23205	779.5	-20.34	32.771	10.28	10.67	H
	23230	782.0	-20.28	32.741	10.31	10.74	
	23255	784.5	-20.53	32.854	10.17	10.41	
	23205	779.5	-22.19	32.5	8.16	6.55	V
	23230	782.0	-22.13	32.52	8.24	6.67	
	23255	784.5	-22.37	32.62	8.10	6.46	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 13							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (mW)**	**Polarization (H/V)**
X	23230	782.0	-19.23	32.737	11.36	13.67	H
	23230	782.0	-21.10	32.52	9.27	8.45	V

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

EIRP Power (dBm)

LTE Band 4							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	19957	1710.7	-25.49	42.49	17.00	50.06	H
	20175	1732.5	-25.46	42.33	16.87	48.61	
	20393	1754.3	-25.16	42.10	16.94	49.43	
	19957	1710.7	-27.52	42.99	15.47	35.24	V
	20175	1732.5	-27.40	42.74	15.34	34.20	
	20393	1754.3	-26.80	42.21	15.41	34.75	
Channel Bandwidth: 1.4 MHz / 16QAM							
Z	19957	1710.7	-26.49	42.49	16.00	39.76	H
	20175	1732.5	-26.46	42.33	15.87	38.61	
	20393	1754.3	-26.17	42.10	15.93	39.17	
	19957	1710.7	-28.52	42.99	14.47	27.99	V
	20175	1732.5	-28.41	42.74	14.33	27.10	
	20393	1754.3	-27.80	42.21	14.41	27.61	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 3 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	19965	1711.5	-25.45	42.49	17.04	50.52	H
	20175	1732.5	-25.46	42.33	16.87	48.61	
	20385	1753.5	-25.12	42.10	16.98	49.89	
	19965	1711.5	-27.48	42.99	15.51	35.56	V
	20175	1732.5	-27.36	42.74	15.38	34.51	
	20385	1753.5	-26.76	42.21	15.45	35.08	
Channel Bandwidth: 3 MHz / 16QAM							
Z	19965	1711.5	-26.46	42.49	16.03	40.04	H
	20175	1732.5	-26.47	42.33	15.86	38.52	
	20385	1753.5	-26.12	42.10	15.98	39.63	
	19965	1711.5	-28.49	42.99	14.50	28.18	V
	20175	1732.5	-28.37	42.74	14.37	27.35	
	20385	1753.5	-27.77	42.21	14.44	27.80	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	19975	1712.5	-25.42	42.49	17.07	50.87	H
	20175	1732.5	-25.42	42.33	16.91	49.06	
	20375	1752.5	-25.08	42.10	17.02	50.35	
	19975	1712.5	-27.44	42.99	15.55	35.89	V
	20175	1732.5	-27.33	42.74	15.41	34.75	
	20375	1752.5	-26.72	42.21	15.49	35.40	
Channel Bandwidth: 5 MHz / 16QAM							
Z	19975	1712.5	-26.42	42.49	16.07	40.41	H
	20175	1732.5	-26.42	42.33	15.91	38.97	
	20375	1752.5	-26.09	42.10	16.01	39.90	
	19975	1712.5	-28.45	42.99	14.54	28.44	V
	20175	1732.5	-28.33	42.74	14.41	27.61	
	20375	1752.5	-27.72	42.21	14.49	28.12	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20000	1715.0	-25.38	42.49	17.11	51.35	H
	20175	1732.5	-25.38	42.33	16.95	49.51	
	20350	1750.0	-25.04	42.10	17.06	50.82	
	20000	1715.0	-27.40	42.99	15.59	36.22	V
	20175	1732.5	-27.29	42.74	15.45	35.08	
	20350	1750.0	-26.69	42.21	15.52	35.65	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20025	1717.5	-25.34	42.49	17.15	51.82	H
	20175	1732.5	-25.34	42.33	16.99	49.97	
	20325	1747.5	-25.00	42.10	17.10	51.29	
	20025	1717.5	-27.36	42.99	15.63	36.56	V
	20175	1732.5	-27.25	42.74	15.49	35.40	
	20325	1747.5	-26.65	42.21	15.56	35.97	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 4							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20050	1720.0	-25.30	42.49	17.19	52.30	H
	20175	1732.5	-25.30	42.33	17.03	50.43	
	20300	1745.0	-24.96	42.10	17.14	51.76	
	20050	1720.0	-27.32	42.99	15.67	36.90	V
	20175	1732.5	-27.21	42.74	15.53	35.73	
	20300	1745.0	-26.61	42.21	15.60	36.31	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

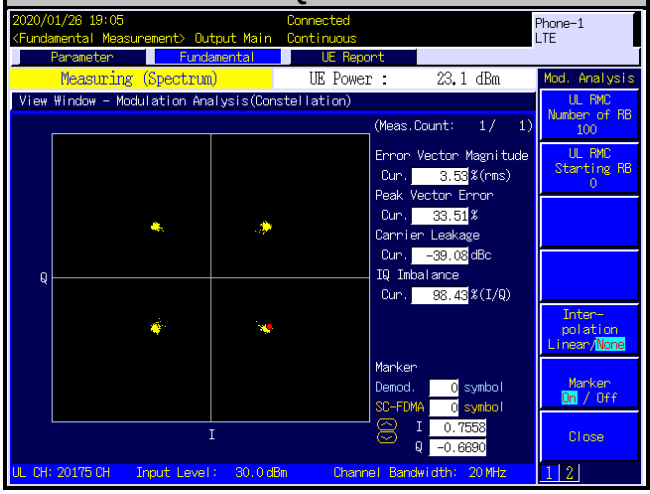
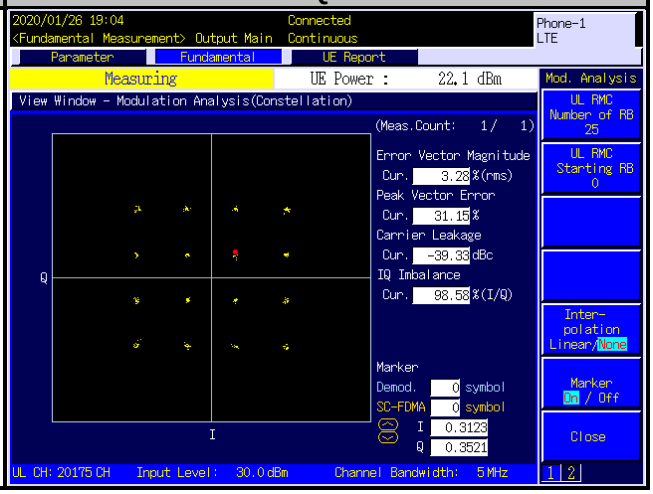
N/A

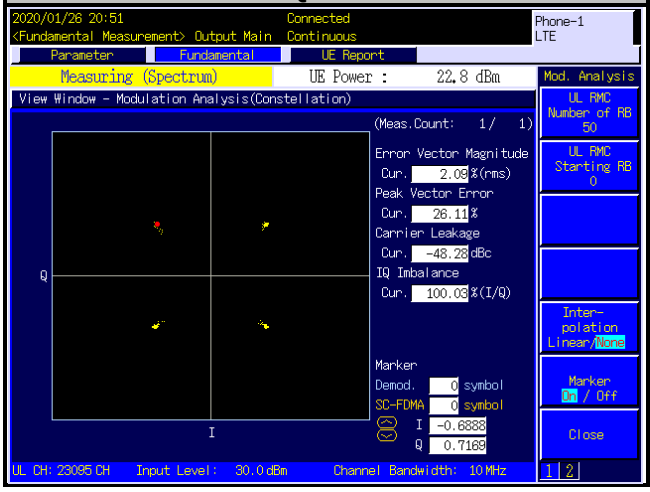
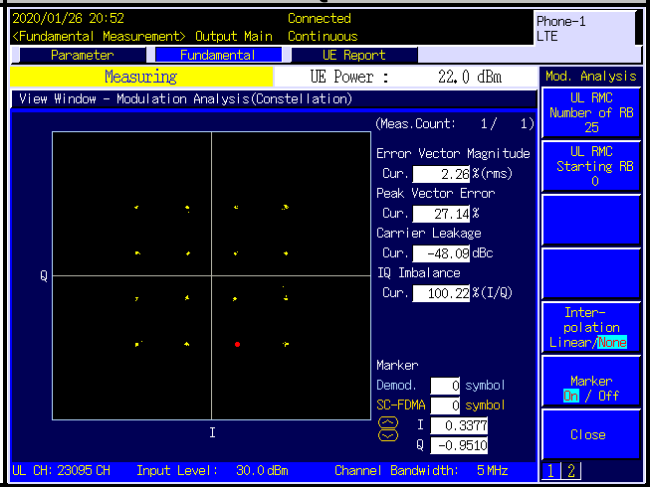
4.2.2 Test Setup

4.2.3 Test Procedure

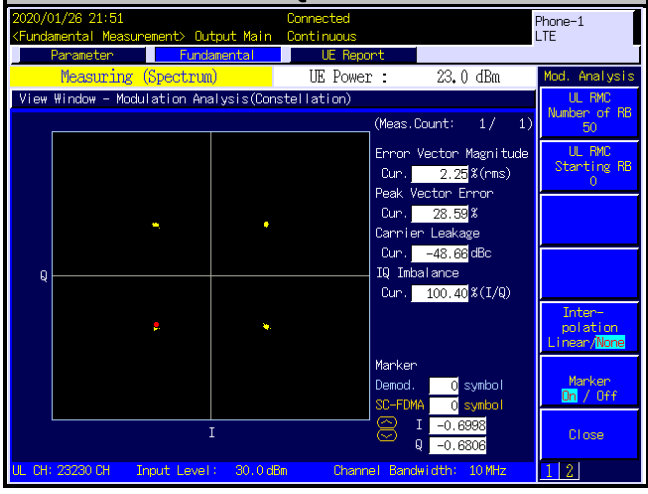
Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

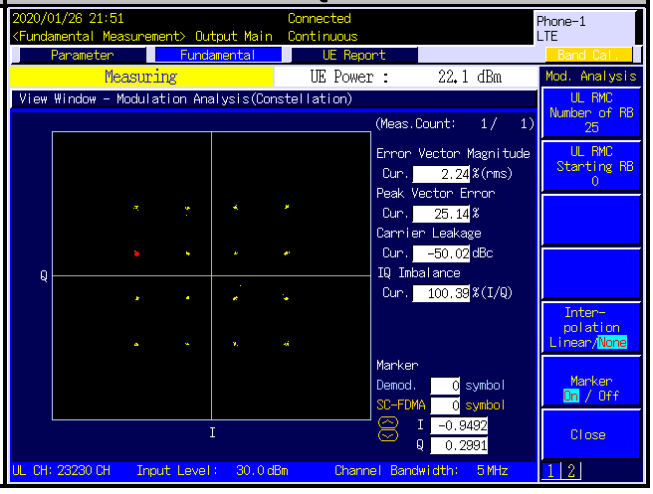
4.2.4 Test Results

Spectrum Plot of Measurement	
LTE Band 4	
Channel 20175	
QPSK	16QAM
	

Spectrum Plot of Measurement	
LTE Band 12	
Channel 23095	
QPSK	16QAM
	

Spectrum Plot of Measurement	
LTE Band 13	
Channel 23230	
QPSK	16QAM





4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

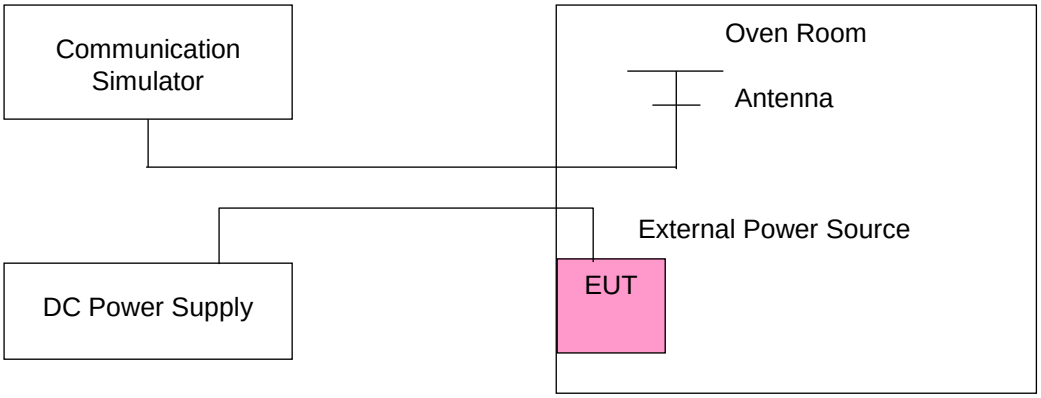
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.3.2 Test Procedure

a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

Note: The frequency error was recorded frequency error from the communication simulator.

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1710.700003	0.002	1754.300003	0.002
3.27	1710.700001	0.001	1754.300004	0.002
4.43	1710.700004	0.002	1754.300003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1710.700003	0.002	1754.300003	0.002
-20	1710.700003	0.002	1754.300002	0.001
-10	1710.700003	0.002	1754.300001	0.001
0	1710.700002	0.001	1754.300002	0.001
10	1710.699997	-0.002	1754.300002	0.001
20	1710.699998	-0.001	1754.299996	-0.002
30	1710.699996	-0.002	1754.299998	-0.001
40	1710.699998	-0.001	1754.299996	-0.002
50	1710.699998	-0.001	1754.299996	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1711.500002	0.001	1753.500003	0.002
3.27	1711.500002	0.001	1753.500003	0.001
4.43	1711.500004	0.002	1753.500003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1711.500002	0.001	1753.500004	0.002
-20	1711.500003	0.002	1753.500004	0.002
-10	1711.500002	0.001	1753.500003	0.002
0	1711.500003	0.002	1753.500002	0.001
10	1711.499999	-0.001	1753.500004	0.002
20	1711.499997	-0.002	1753.499997	-0.002
30	1711.499997	-0.002	1753.499997	-0.001
40	1711.499999	-0.001	1753.499998	-0.001
50	1711.499996	-0.002	1753.499998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1712.500002	0.001	1752.500001	0.001
3.27	1712.500002	0.001	1752.500002	0.001
4.43	1712.500003	0.002	1752.500004	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1712.500002	0.001	1752.500002	0.001
-20	1712.500003	0.002	1752.500001	0.001
-10	1712.500003	0.002	1752.500002	0.001
0	1712.500003	0.002	1752.500001	0.001
10	1712.499997	-0.002	1752.500004	0.002
20	1712.499997	-0.002	1752.499997	-0.002
30	1712.499999	-0.001	1752.499998	-0.001
40	1712.499998	-0.001	1752.499997	-0.002
50	1712.499997	-0.002	1752.499997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1715.000004	0.002	1750.000002	0.001
3.27	1715.000001	0.001	1750.000002	0.001
4.43	1715.000001	0.001	1750.000002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1715.000004	0.002	1750.000003	0.002
-20	1715.000004	0.002	1750.000002	0.001
-10	1715.000002	0.001	1750.000004	0.002
0	1715.000002	0.001	1750.000002	0.001
10	1714.999999	-0.001	1750.000003	0.002
20	1714.999997	-0.002	1749.999999	-0.001
30	1714.999997	-0.002	1749.999997	-0.002
40	1714.999996	-0.002	1749.999998	-0.001
50	1714.999998	-0.001	1749.999996	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1717.500003	0.001	1747.500003	0.002
3.27	1717.500002	0.001	1747.500002	0.001
4.43	1717.500002	0.001	1747.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1717.500001	0.001	1747.500002	0.001
-20	1717.500002	0.001	1747.500001	0.001
-10	1717.500001	0.001	1747.500002	0.001
0	1717.500003	0.002	1747.500004	0.002
10	1717.499997	-0.002	1747.500003	0.001
20	1717.499998	-0.001	1747.499997	-0.001
30	1717.499998	-0.001	1747.499997	-0.002
40	1717.499996	-0.002	1747.499997	-0.002
50	1717.499996	-0.002	1747.499997	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	1720.000001	0.001	1745.000004	0.002
3.27	1720.000001	0.001	1745.000001	0.001
4.43	1720.000001	0.001	1745.000003	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1720.000002	0.001	1745.000003	0.002
-20	1720.000002	0.001	1745.000003	0.001
-10	1720.000004	0.002	1745.000004	0.002
0	1720.000003	0.002	1745.000002	0.001
10	1719.999997	-0.002	1745.000002	0.001
20	1719.999998	-0.001	1744.999998	-0.001
30	1719.999999	-0.001	1744.999998	-0.001
40	1719.999996	-0.002	1744.999999	-0.001
50	1719.999997	-0.002	1744.999998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	699.700002	0.003	715.300002	0.003
3.27	699.700002	0.002	715.300004	0.006
4.43	699.700001	0.002	715.300004	0.005

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	699.700001	0.002	715.300002	0.003
-20	699.700004	0.005	715.300001	0.002
-10	699.700004	0.005	715.300002	0.003
0	699.700002	0.003	715.300002	0.002
10	699.699999	-0.002	715.300002	0.002
20	699.699996	-0.006	715.299997	-0.004
30	699.699997	-0.005	715.299997	-0.004
40	699.699998	-0.003	715.299998	-0.003
50	699.699996	-0.005	715.299997	-0.004

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	700.500003	0.004	714.500001	0.002
3.27	700.500003	0.004	714.500002	0.002
4.43	700.500003	0.004	714.500003	0.004

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	700.500003	0.005	714.500002	0.003
-20	700.500003	0.004	714.500004	0.005
-10	700.500003	0.004	714.500002	0.003
0	700.500001	0.001	714.500003	0.005
10	700.499998	-0.003	714.500003	0.004
20	700.499999	-0.002	714.499998	-0.003
30	700.499997	-0.004	714.499998	-0.003
40	700.499999	-0.001	714.499998	-0.002
50	700.499999	-0.001	714.499998	-0.003

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	701.500003	0.005	713.500004	0.005
3.27	701.500002	0.003	713.500002	0.002
4.43	701.500004	0.005	713.500002	0.002

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	701.500003	0.004	713.500002	0.002
-20	701.500002	0.002	713.500002	0.003
-10	701.500002	0.003	713.500002	0.003
0	701.500001	0.002	713.500004	0.005
10	701.499999	-0.002	713.500001	0.002
20	701.499999	-0.002	713.499998	-0.003
30	701.499998	-0.002	713.499998	-0.003
40	701.499998	-0.003	713.499997	-0.005
50	701.499998	-0.004	713.499997	-0.004

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	704.000002	0.003	711.000003	0.004
3.27	704.000002	0.003	711.000003	0.005
4.43	704.000002	0.002	711.000002	0.003

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 12			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	704.000004	0.005	711.000004	0.005
-20	704.000003	0.004	711.000001	0.002
-10	704.000003	0.004	711.000004	0.006
0	704.000003	0.005	711.000002	0.003
10	703.999997	-0.005	711.000002	0.003
20	703.999998	-0.002	710.999996	-0.005
30	703.999999	-0.001	710.999996	-0.005
40	703.999998	-0.003	710.999997	-0.004
50	703.999996	-0.006	710.999998	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	779.500004	0.005	784.500001	0.002
3.27	779.500003	0.004	784.500004	0.005
4.43	779.500001	0.002	784.500003	0.004

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	779.500004	0.005	784.500003	0.004
-20	779.500004	0.005	784.500002	0.003
-10	779.500004	0.005	784.500003	0.004
0	779.500001	0.001	784.500003	0.003
10	779.499998	-0.003	784.500003	0.004
20	779.499998	-0.003	784.499999	-0.001
30	779.499998	-0.003	784.499997	-0.003
40	779.499997	-0.004	784.499999	-0.001
50	779.499996	-0.005	784.499997	-0.004

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
3.85	782.000001	0.001
3.27	782.000001	0.001
4.43	782.000004	0.005

Note: The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 13	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
-30	782.000001	0.002
-20	782.000003	0.003
-10	782.000001	0.001
0	782.000002	0.003
10	781.999997	-0.004
20	781.999997	-0.004
30	781.999997	-0.004
40	781.999998	-0.002
50	781.999996	-0.005

4.4 Occupied Bandwidth Measurement

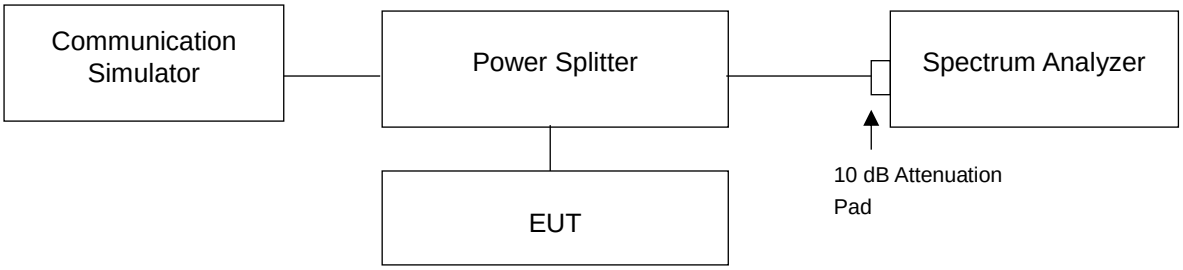
4.4.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.2 Test Procedure

a. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.4.3 Test Setup

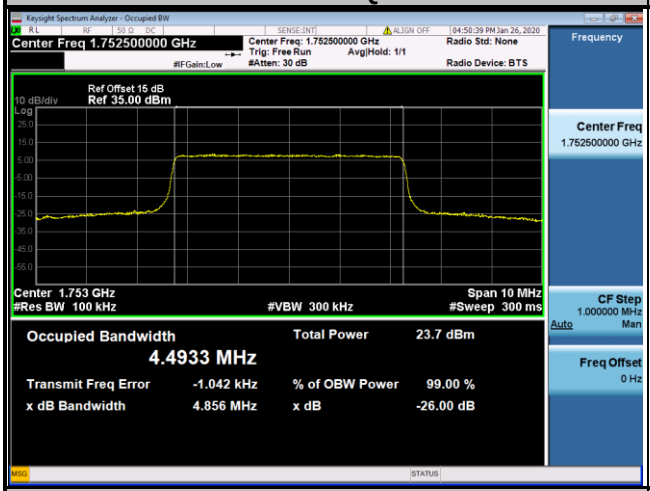


4.4.4 Test Result

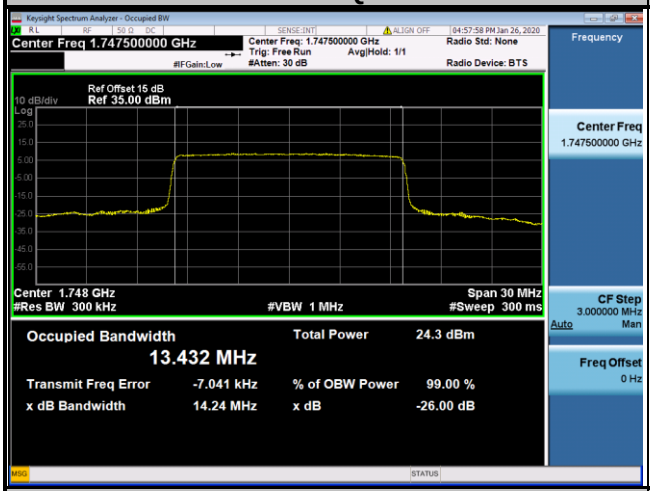
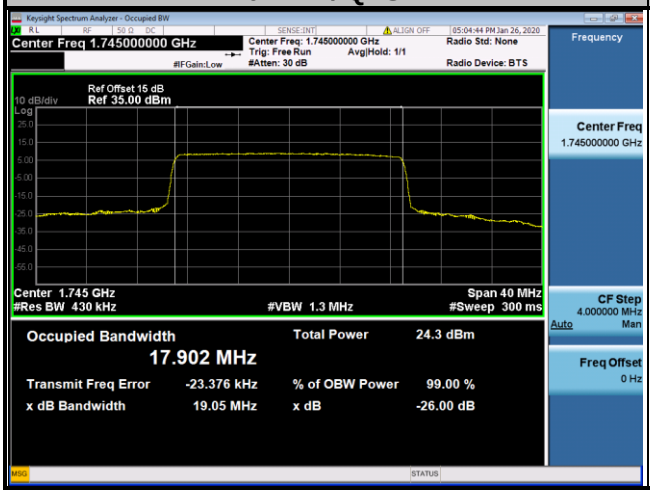
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
19957	1710.7	1.0901	1.0907	1.285	1.273
20175	1732.5	1.0889	1.0868	1.276	1.243
20393	1754.3	1.0924	1.0984	1.352	1.564
Channel Bandwidth: 3 MHz					
Channel	**Frequency (MHz)**	**99 % Occupied Bandwidth (MHz)**		**26 dB Bandwidth (MHz)**	
		QPSK	**16QAM**	**QPSK**	**16QAM**
19965	1711.5	2.7039	2.6987	2.944	2.932
20175	1732.5	2.7029	2.6981	2.934	2.927
20385	1753.5	2.7170	2.6979	4.426	2.927

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	**26 dB Bandwidth**
1.4 MHz / 16QAM	**1.4 MHz / 16QAM**
3 MHz / QPSK	**3 MHz / QPSK**

LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
19975	1712.5	4.4894	4.4912	4.815	4.823
20175	1732.5	4.4894	4.4896	4.818	4.830
20375	1752.5	4.4924	4.4933	4.845	4.856
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK		QPSK	
20000	1715.0	8.9508		9.506	
20175	1732.5	8.9534		9.519	
20350	1750.0	8.9538		9.545	

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz / 16QAM	5 MHz / 16QAM
	
10 MHz / QPSK	10 MHz / QPSK

LTE Band 4			
Channel Bandwidth: 15 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
		QPSK	QPSK
20025	1717.5	13.430	14.23
20175	1732.5	13.426	14.22
20325	1747.5	13.432	14.24
Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
		QPSK	QPSK
20050	1720.0	17.887	19.02
20175	1732.5	17.871	19.03
20300	1745.0	17.902	19.05

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
15 MHz / QPSK	15 MHz / QPSK
	
20 MHz / QPSK	20 MHz / QPSK
	

LTE Band 12					
Channel Bandwidth: 1.4 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23017	699.7	1.0866	1.0893	1.250	1.249
23095	707.5	1.0879	1.0924	1.244	1.242
23173	715.3	1.0882	1.0894	1.241	1.234
Channel Bandwidth: 3 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23025	700.5	2.6996	2.6964	2.904	2.920
23095	707.5	2.7012	2.7002	2.920	2.926
23165	714.5	2.6994	2.6952	2.920	2.911

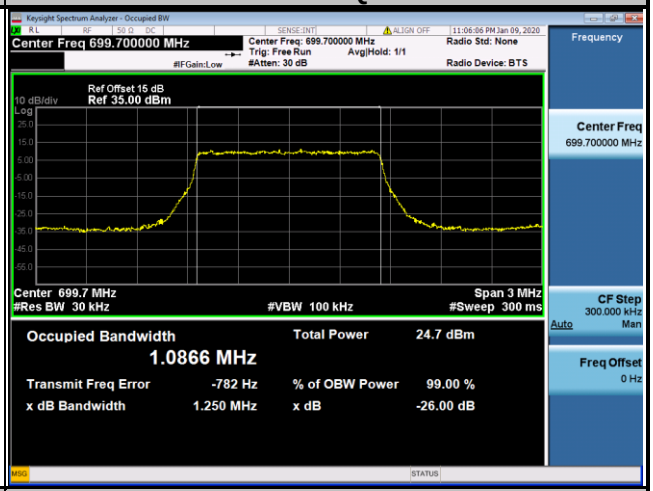
Spectrum Plot of Worst Value

99 % Occupied Bandwidth

1.4 MHz / 16QAM

26 dB Bandwidth

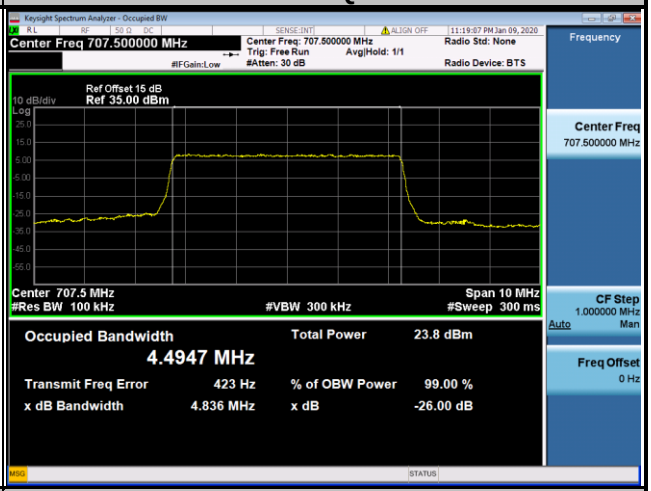
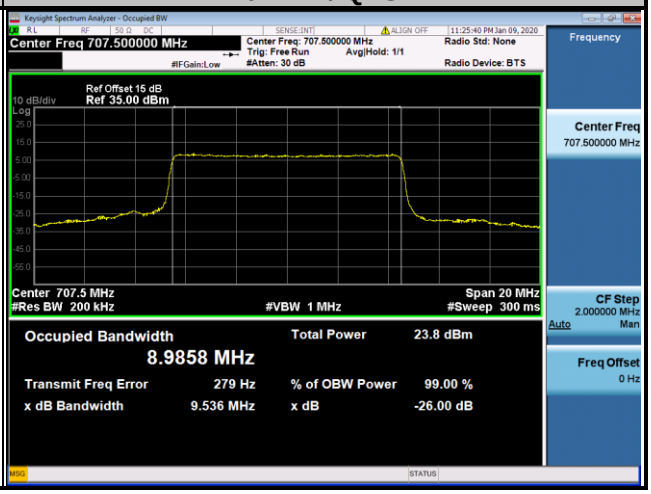
1.4 MHz / QPSK



3 MHz / QPSK

3 MHz / 16QAM

LTE Band 12					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23035	701.5	4.4800	4.4803	4.796	4.797
23095	707.5	4.4947	4.4987	4.836	4.827
23155	713.5	4.4796	4.4829	4.790	4.803
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK		QPSK	
23060	704.0	8.9331		9.481	
23095	707.5	8.9858		9.536	
23130	711.0	8.9424		9.492	

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz / 16QAM	5 MHz / QPSK
	
10 MHz / QPSK	10 MHz / QPSK
	

LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23205	779.5	4.4891	4.4911	4.812	4.820
23230	782.0	4.4867	4.4875	4.812	4.819
23255	784.5	4.4947	4.5012	4.858	4.832
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK		QPSK	
23230	782.0	8.9453		9.508	

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz / 16QAM	5 MHz / QPSK
10 MHz / QPSK	10 MHz / QPSK

4.5 Band Edge Measurement

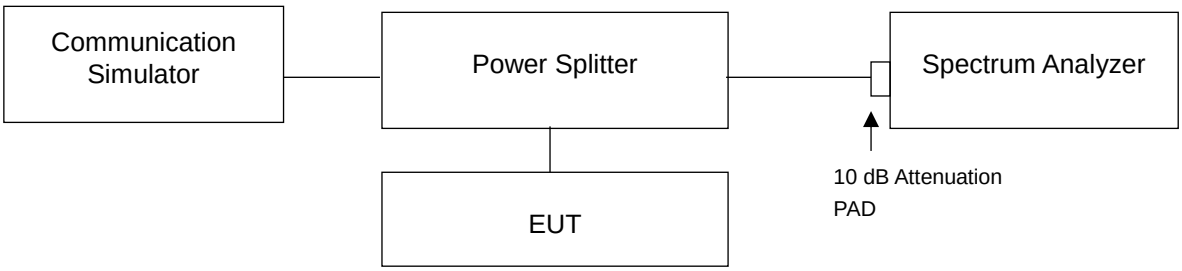
4.5.1 Limits of Band Edge Measurement

For operations in the 698-787 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.
However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.
On all frequencies between 763-775 MHz and 793-805 MHz, by a factor no less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

For operations in the 1710–1755 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB.

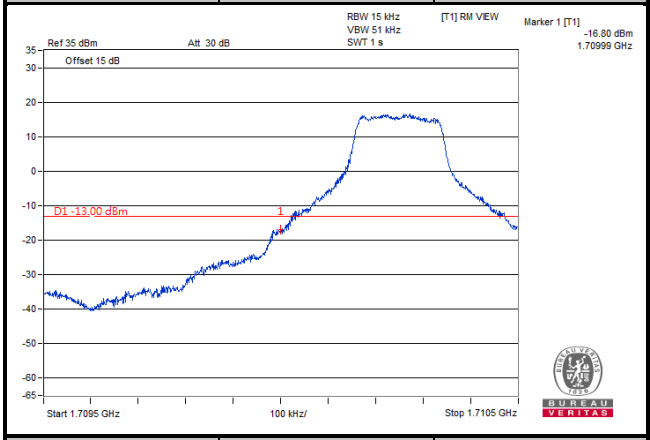
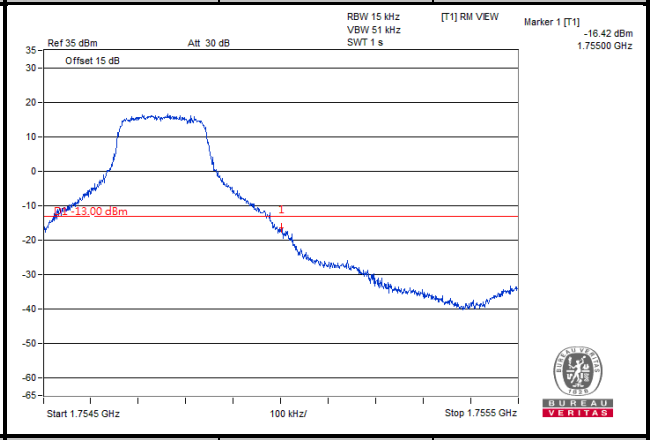
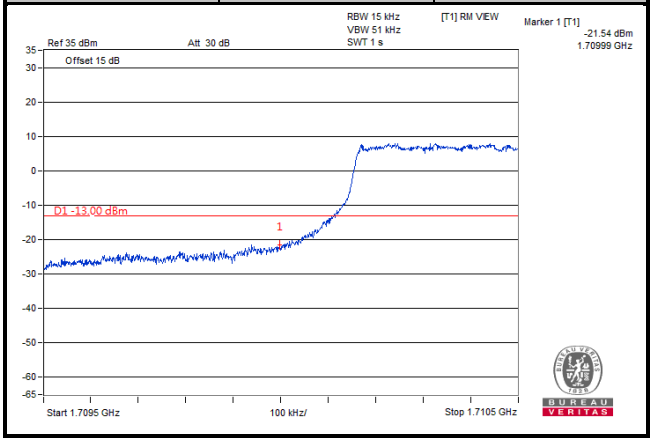
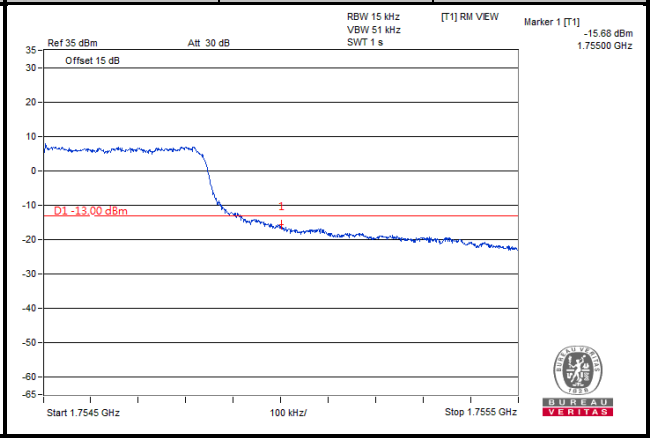
4.5.2 Test Setup

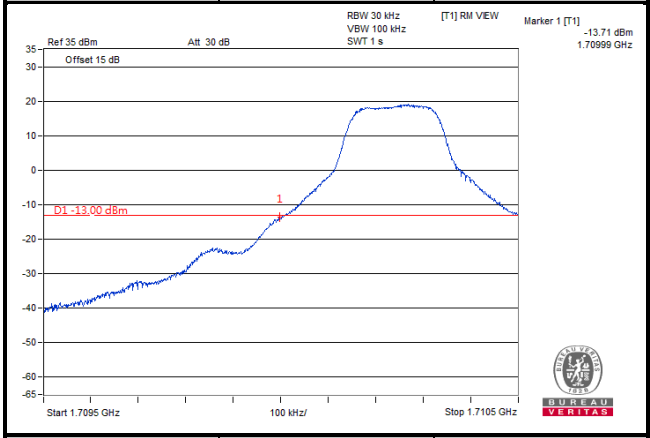
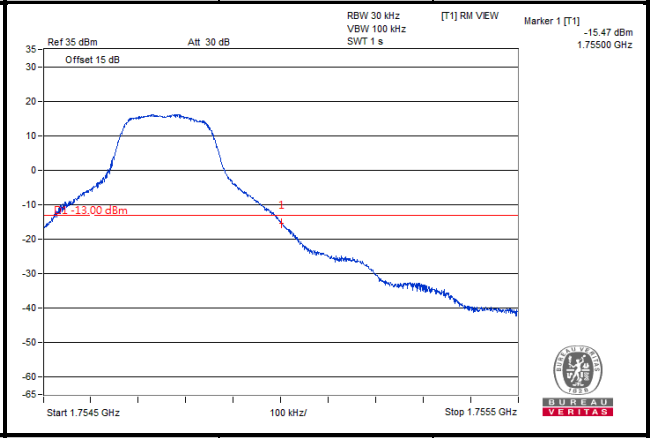
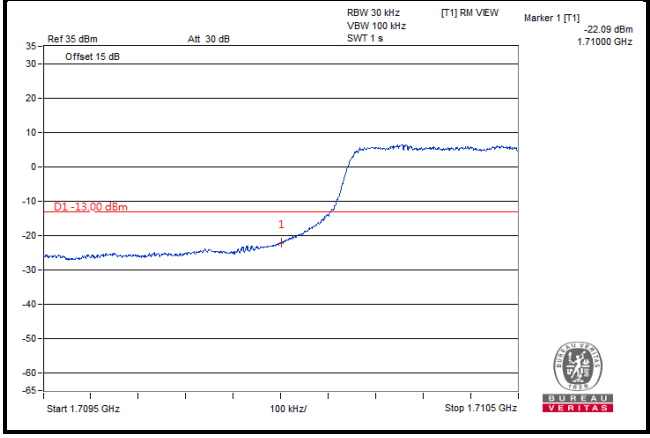
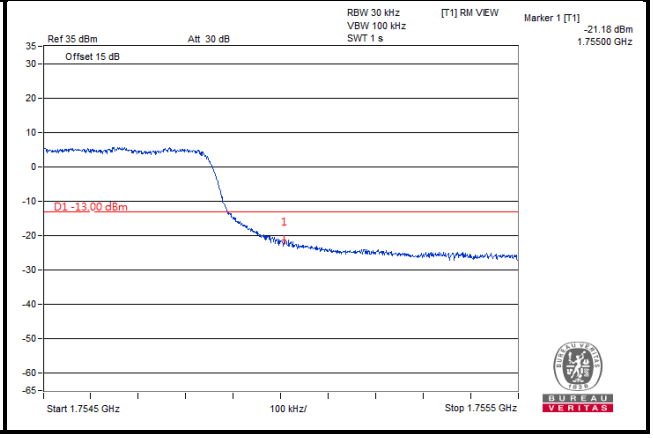


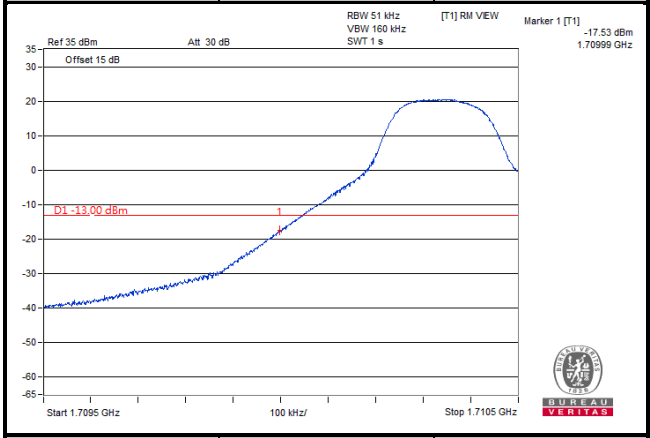
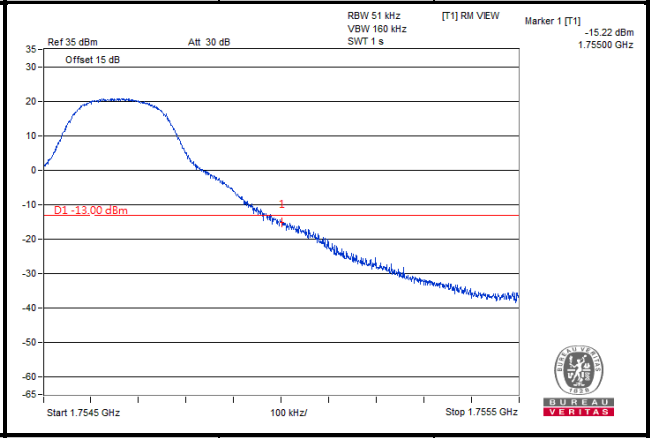
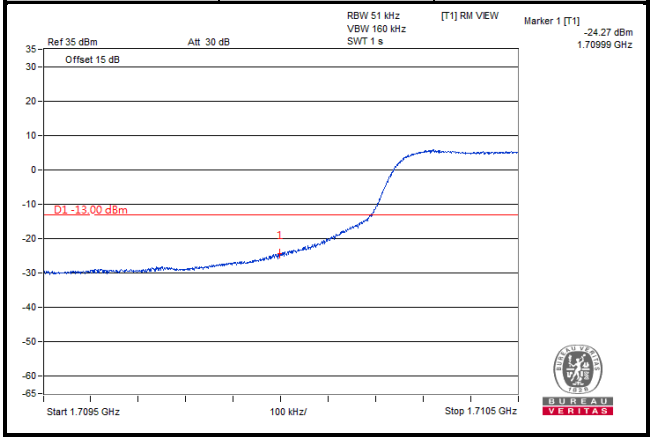
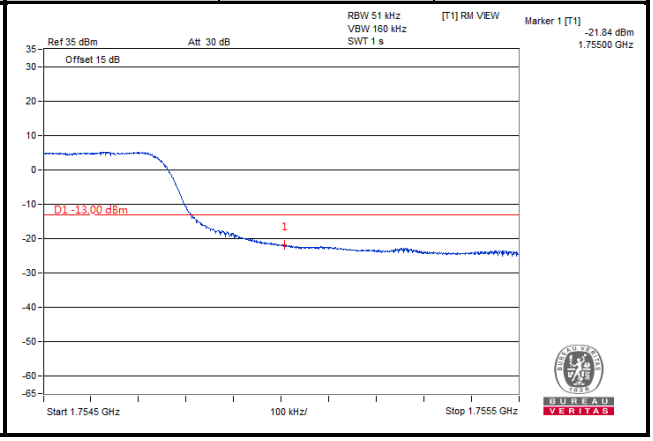
4.5.3 Test Procedures

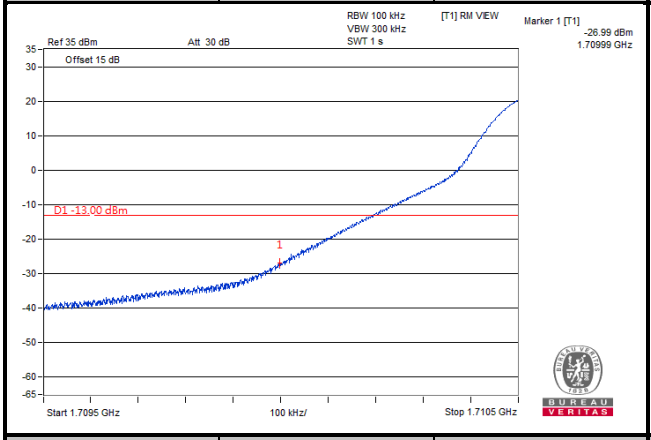
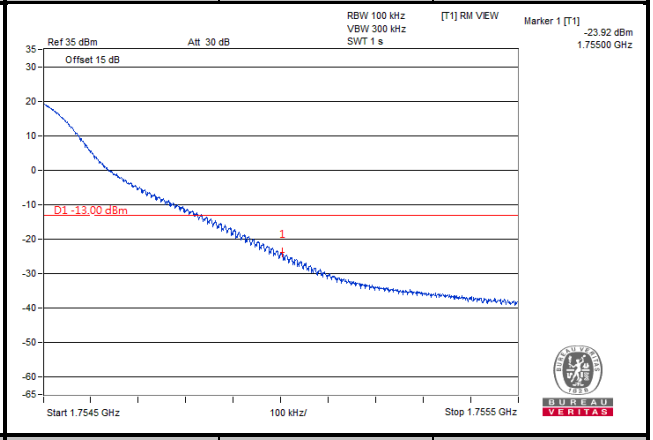
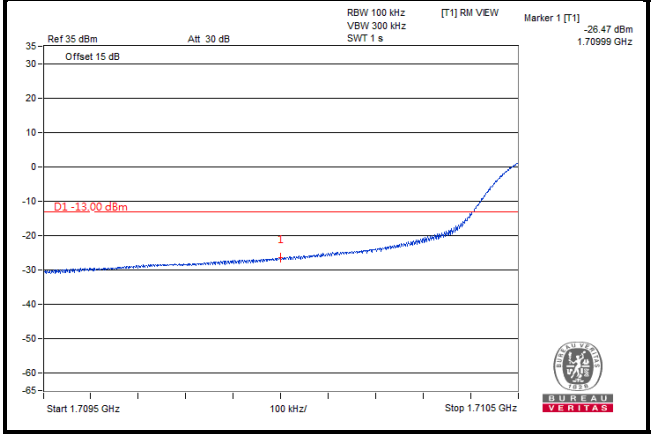
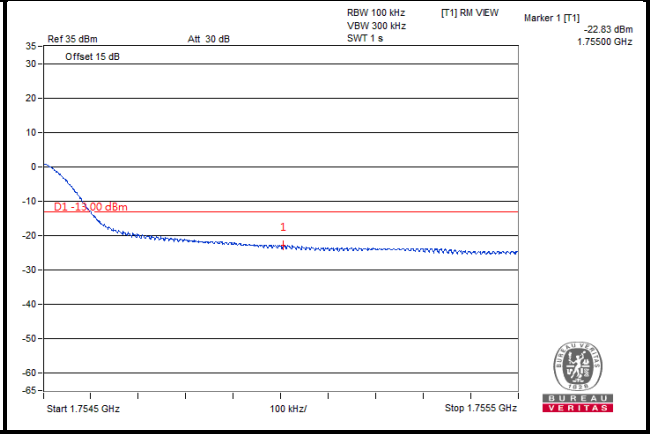
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 15 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz). RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (only for LTE Band 12 Bandwidth 1.4 MHz).
c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (LTE Bandwidth 5 MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 10 MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 150 kHz and VB of the spectrum is 470 kHz (LTE Bandwidth 15 MHz).
g. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 20 MHz).
h. Record the max. trace plot into the test report.

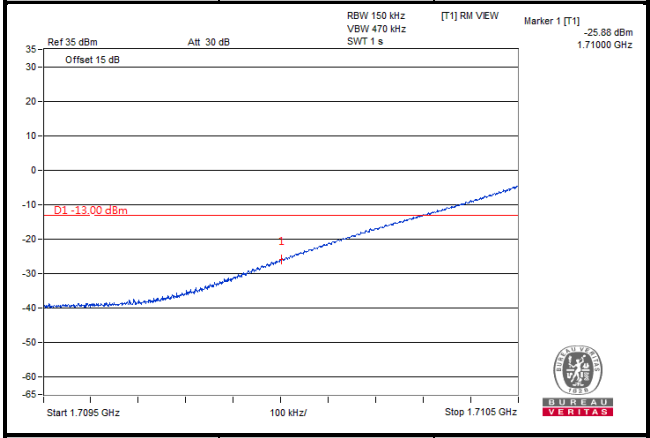
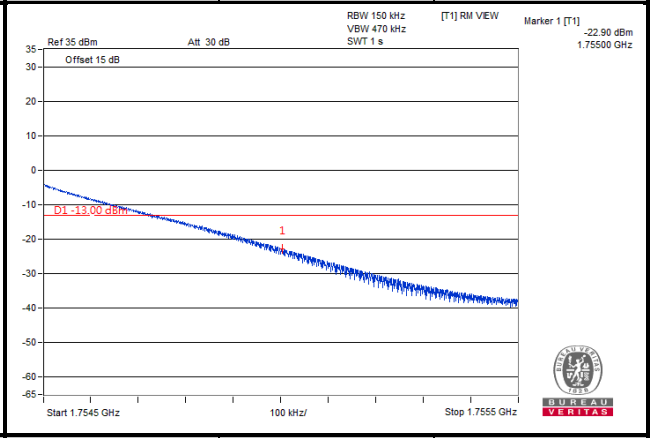
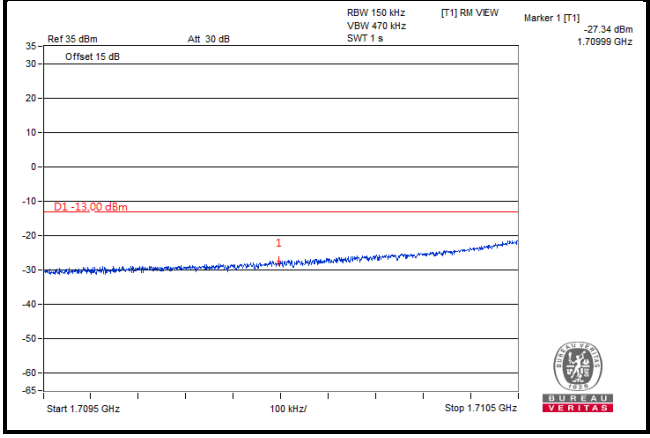
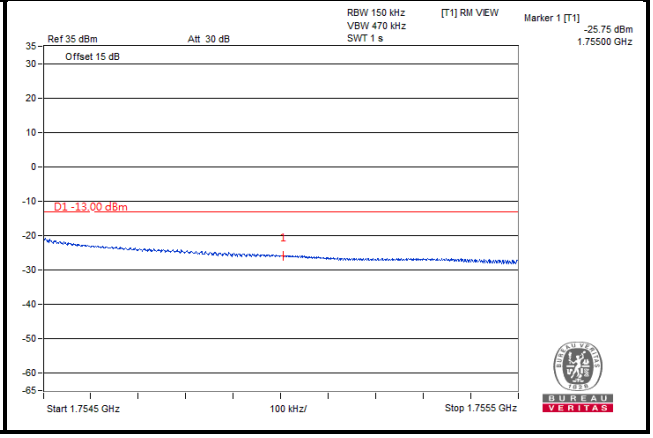
4.5.4 Test Results

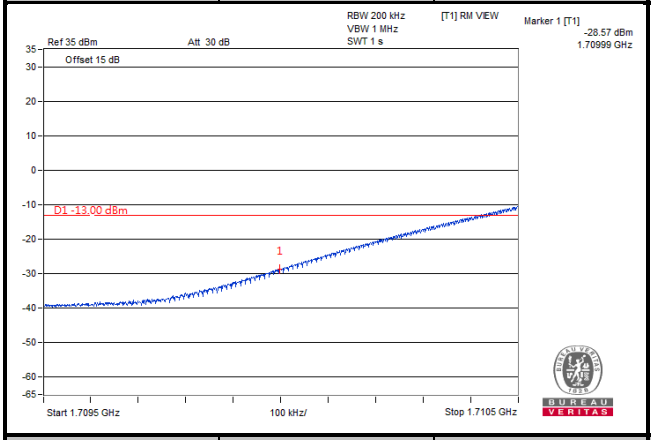
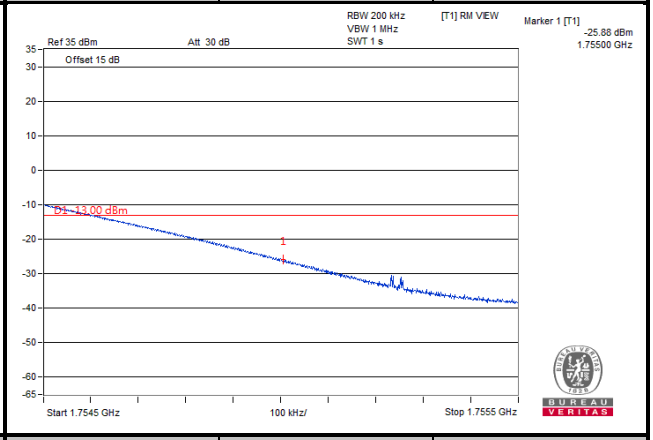
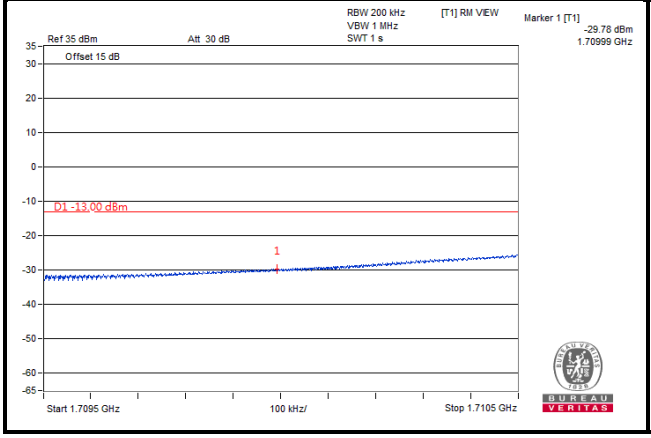
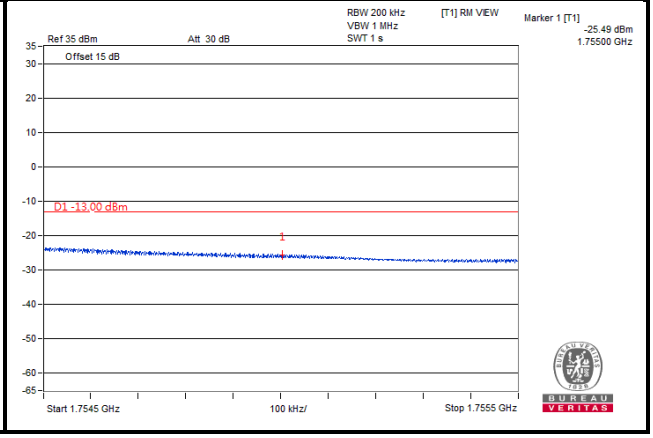
LTE Band 4					
Channel Bandwidth: 1.4 MHz					
Channel	19957	1 RB	Channel	20393	1 RB
					
Channel	19957	6 RB	Channel	20393	6 RB
					

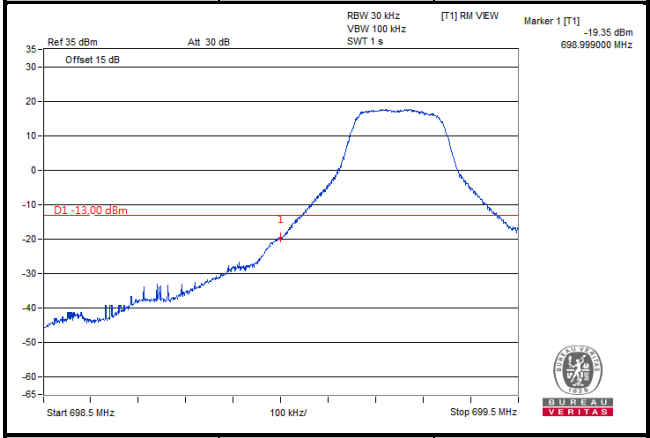
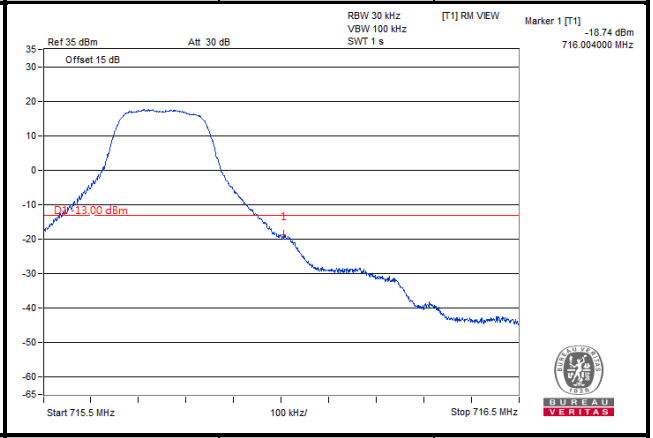
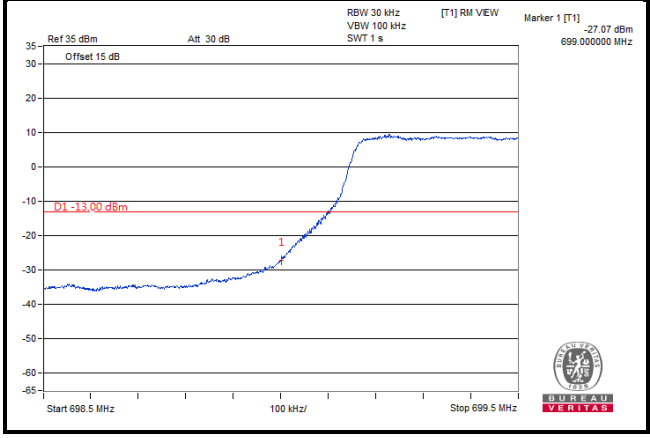
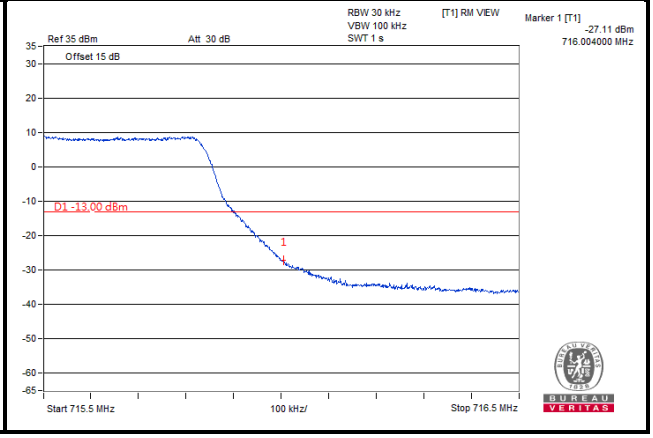
LTE Band 4					
Channel Bandwidth: 3 MHz					
Channel	19965	1 RB	Channel	20385	1 RB
					
Channel	19965	15 RB	Channel	20385	15 RB
					

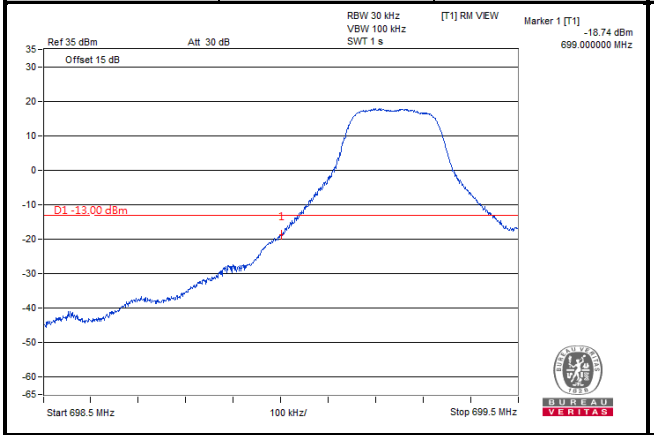
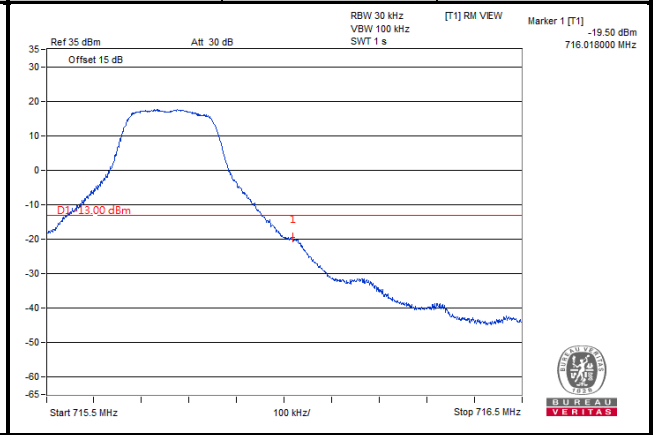
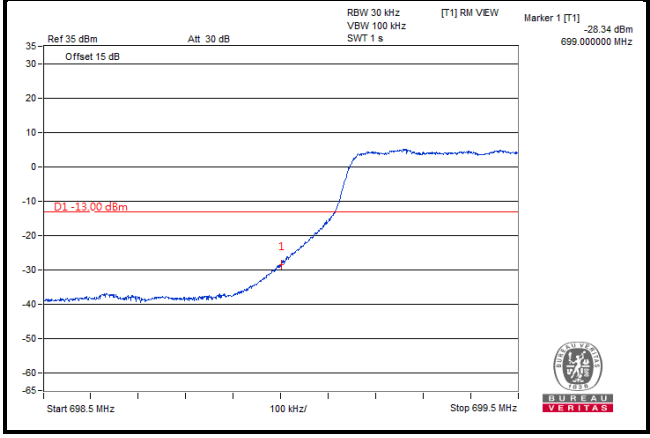
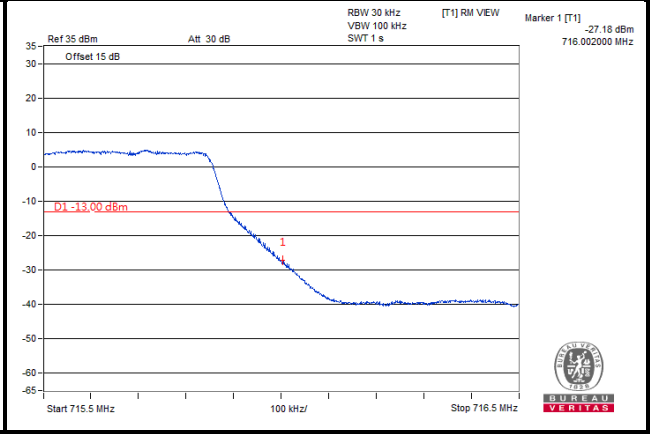
LTE Band 4					
Channel Bandwidth: 5 MHz					
Channel	19975	1 RB	Channel	20375	1 RB
					
Channel	19975	25 RB	Channel	20375	25 RB
					

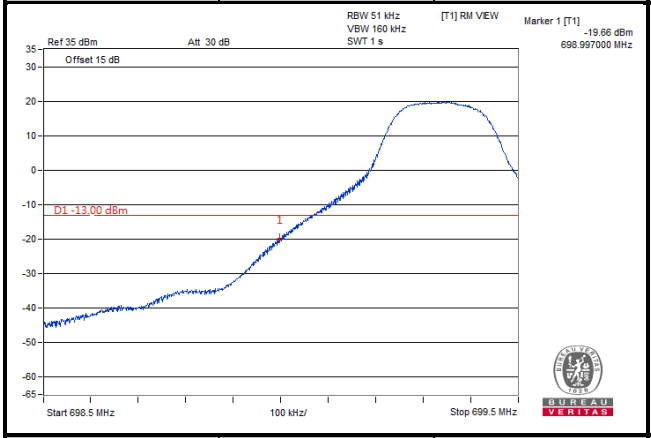
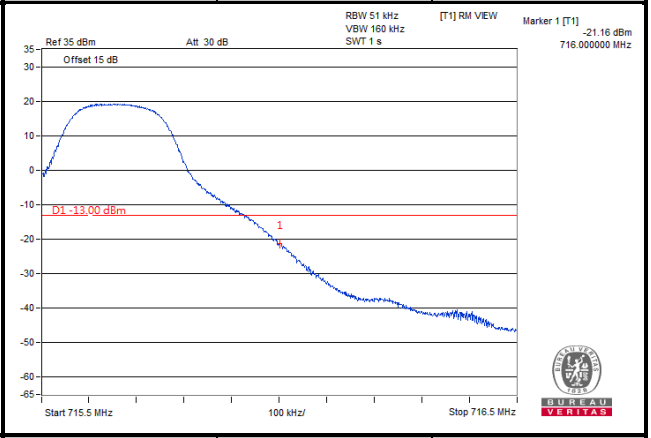
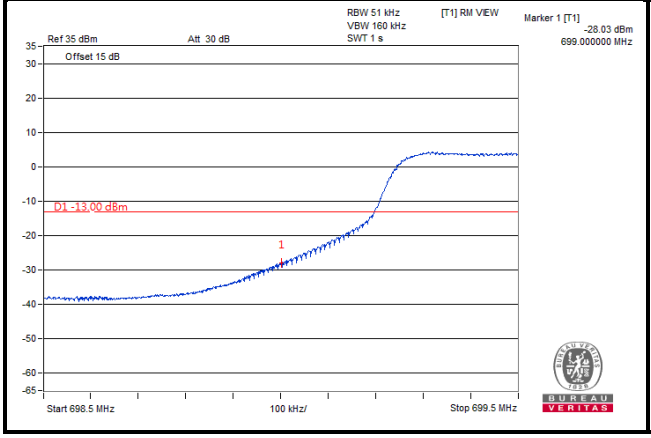
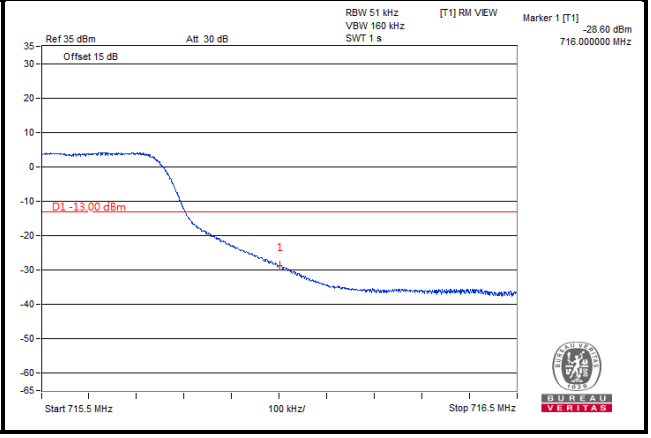
LTE Band 4					
Channel Bandwidth: 10 MHz					
Channel	20000	1 RB	Channel	20350	1 RB
					
Channel	20000	50 RB	Channel	20350	50 RB
					

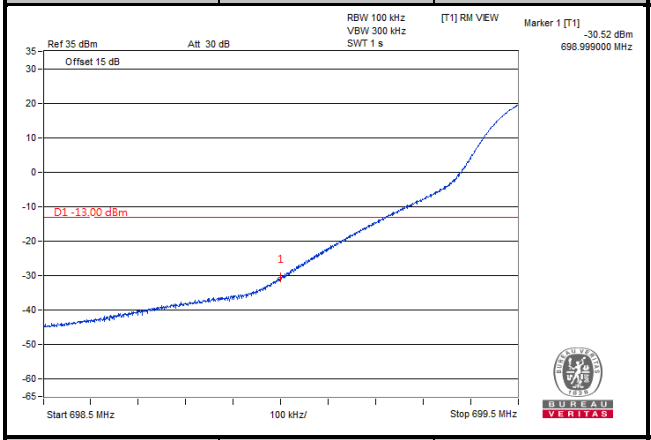
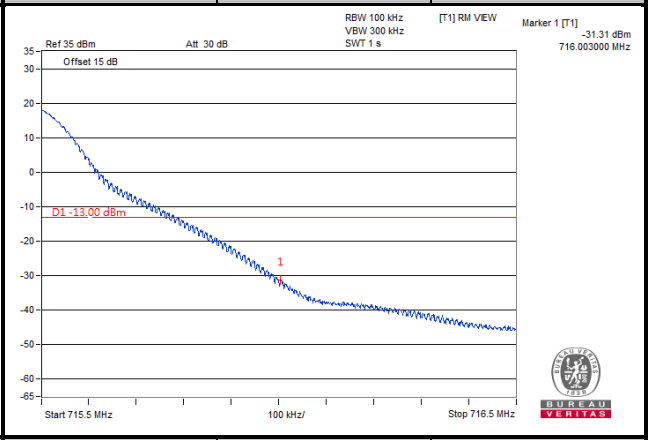
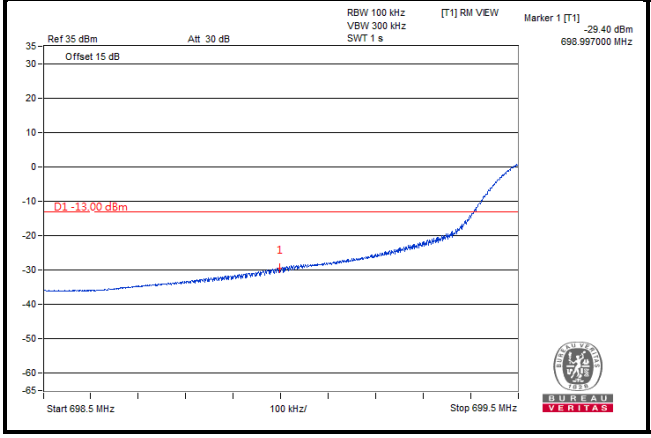
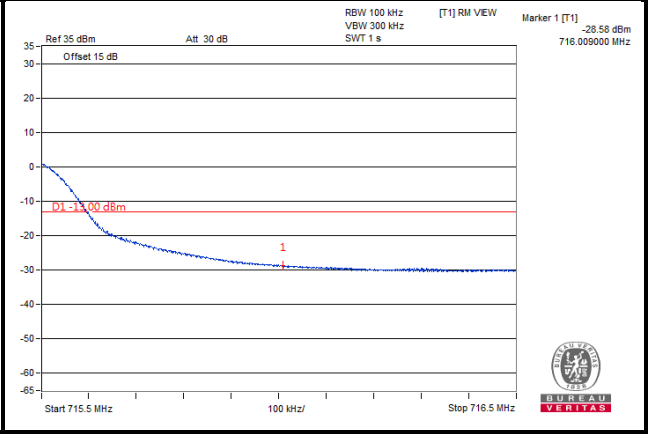
LTE Band 4					
Channel Bandwidth: 15 MHz					
Channel	20025	1 RB	Channel	20325	1 RB
					
Channel	20025	75 RB	Channel	20325	75 RB
					

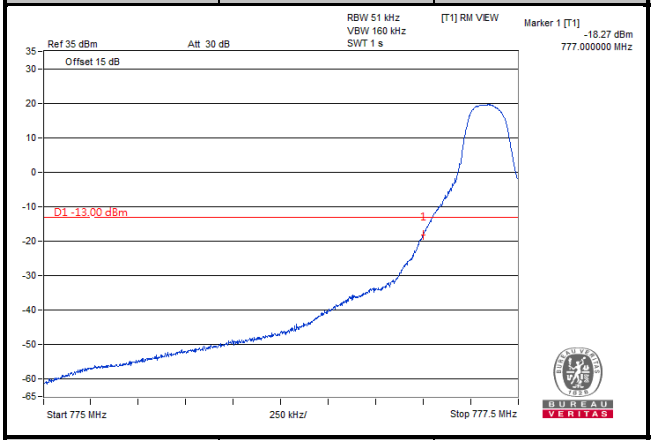
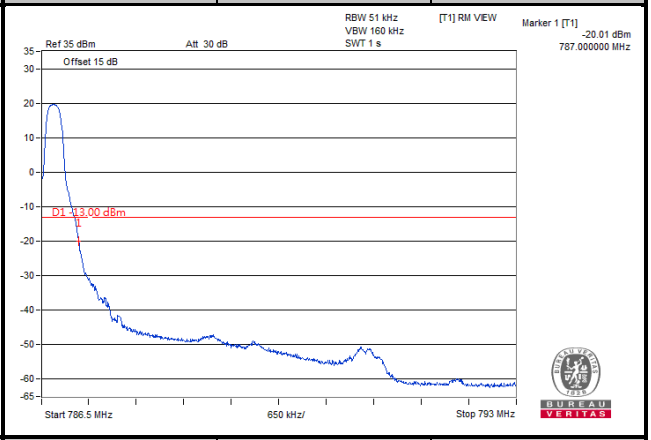
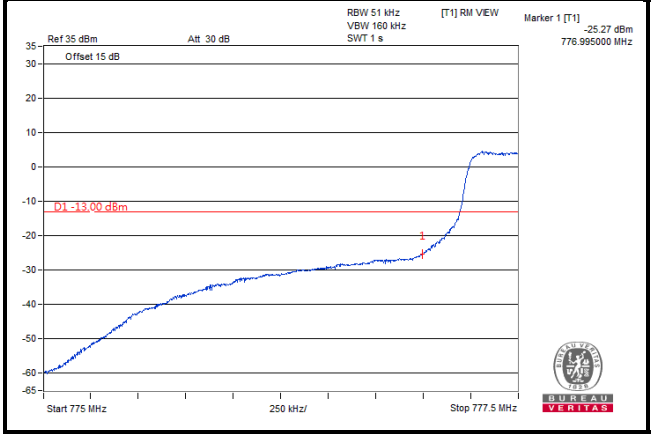
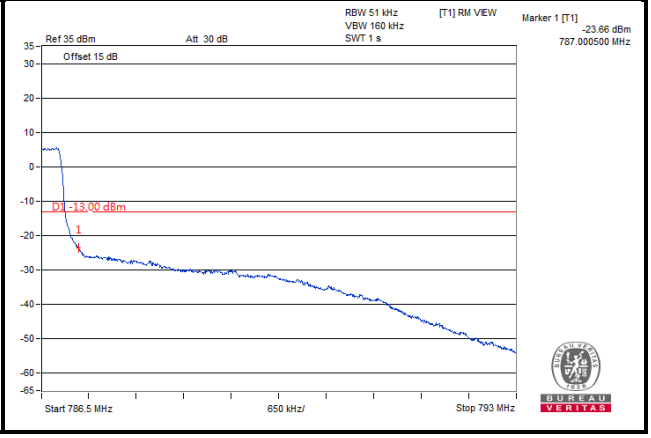
LTE Band 4					
Channel Bandwidth: 20 MHz					
Channel	20050	1 RB	Channel	20300	1 RB
					
Channel	20050	100 RB	Channel	20300	100 RB
					

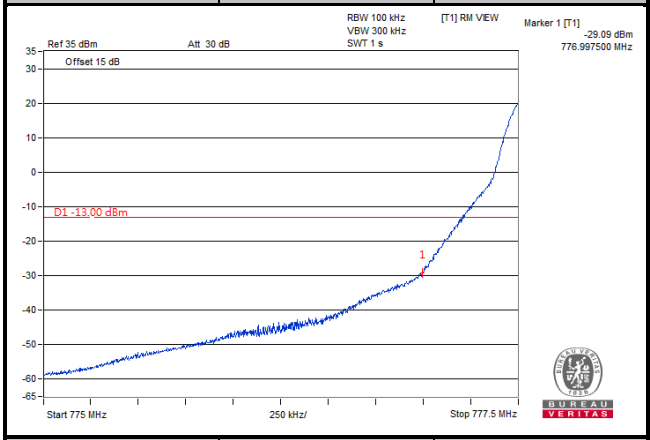
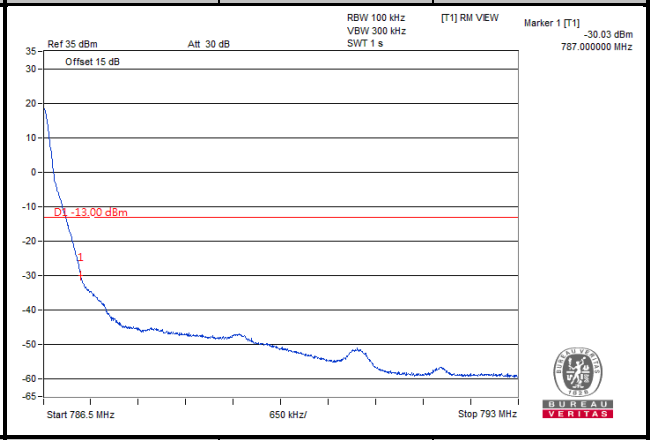
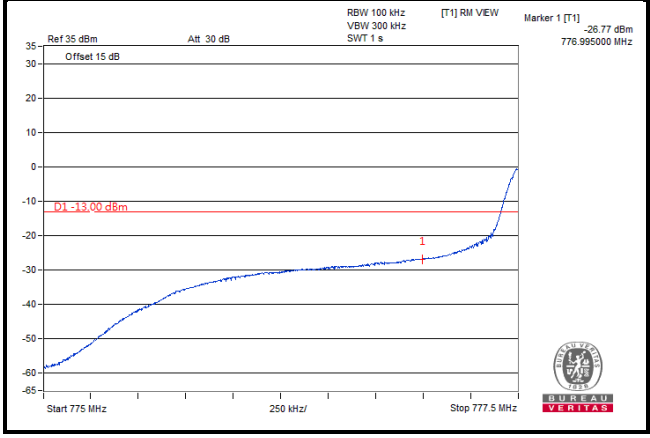
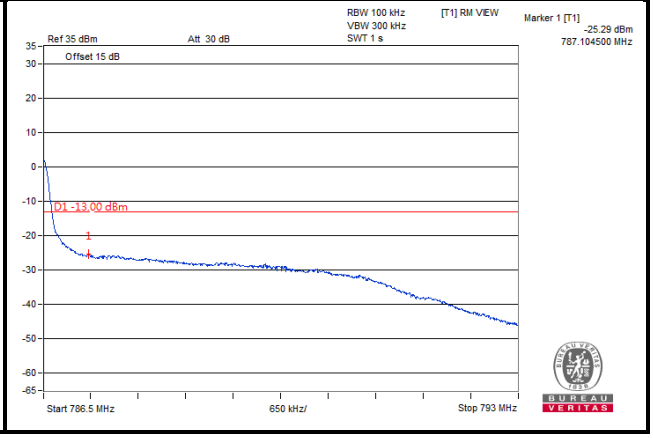
LTE Band 12					
Channel Bandwidth: 1.4 MHz					
Channel	23017	1 RB	Channel	23173	1 RB
					
Channel	23017	6 RB	Channel	23173	6 RB
					

LTE Band 12					
Channel Bandwidth: 3 MHz					
Channel	23025	1 RB	Channel	23165	1 RB
					
Channel	23025	15 RB	Channel	23165	15 RB
					

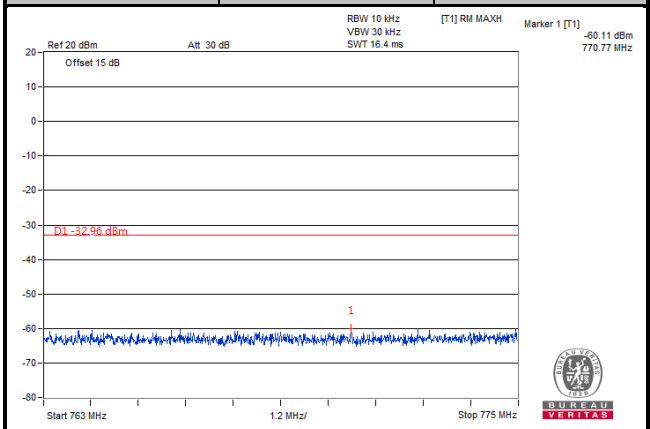
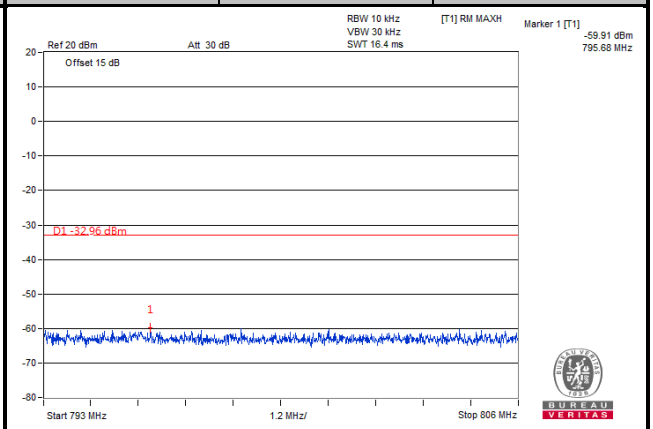
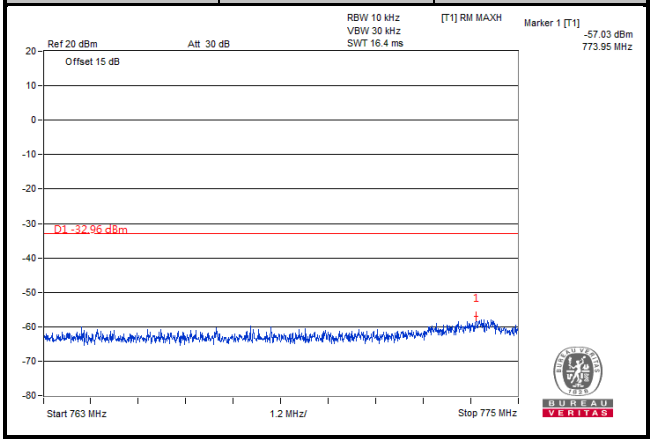
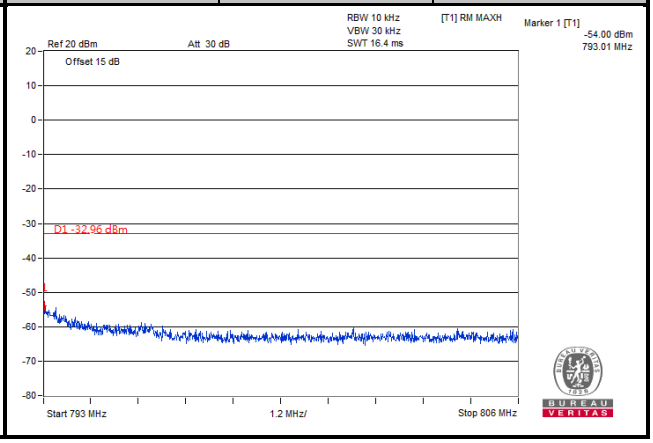
LTE Band 12					
Channel Bandwidth: 5 MHz					
Channel	23035	1 RB	Channel	23155	1 RB
					
Channel	23035	25 RB	Channel	23155	25 RB
					

LTE Band 12					
Channel Bandwidth: 10 MHz					
Channel	23060	1 RB	Channel	23130	1 RB
					
Channel	23060	50 RB	Channel	23130	50 RB
					

LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	23205	1 RB	Channel	23255	1 RB
					
Channel	23205	25 RB	Channel	23255	25 RB
					

LTE Band 13					
Channel Bandwidth: 10 MHz					
Channel	23230	1 RB	Channel	23230	1 RB
					
Channel	23230	50 RB	Channel	23230	50 RB
					

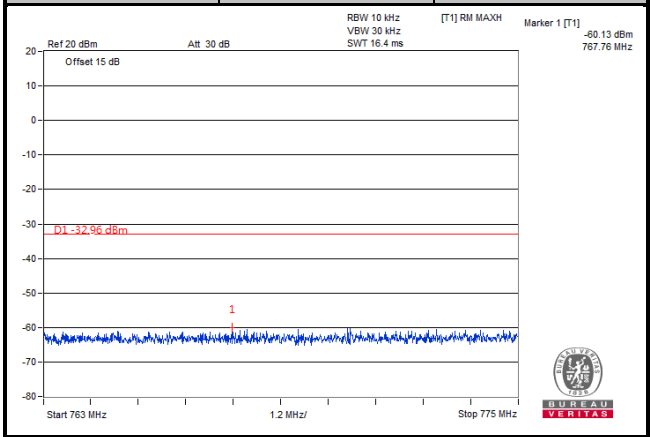
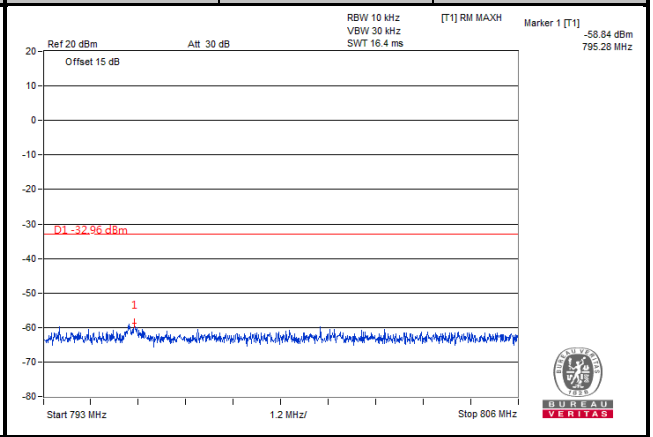
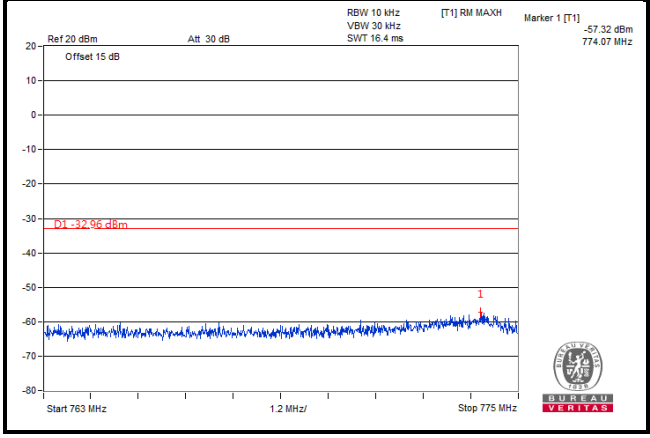
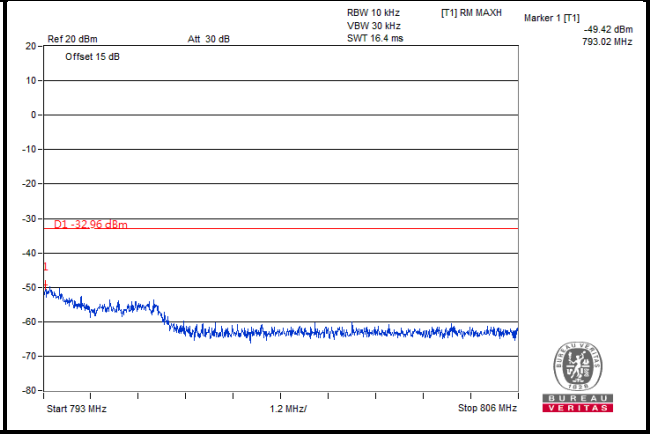
Emission Mask

LTE Band 13					
Channel Bandwidth: 5 MHz					
Channel	23205	1 RB	Channel	23255	1 RB
					
Channel	23205	25 RB	Channel	23255	25 RB
					

For the 763 - 775 MHz and 793 - 805 MHz band, the FCC limit is 65+10log(P[watt]) in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.

10log(10kHz/6.25kHz) = 2.04 dB

Limit line = -35 dBm + 2.04 dB = -32.96 dBm

LTE Band 13					
Channel Bandwidth: 10 MHz					
Channel	23230	1 RB	Channel	23230	1 RB
					
Channel	23230	50 RB	Channel	23230	50 RB
					

For the 763 - 775 MHz and 793 - 805 MHz band, the FCC limit is 65+10log(P[watt]) in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.

10log(10kHz/6.25kHz) = 2.04 dB

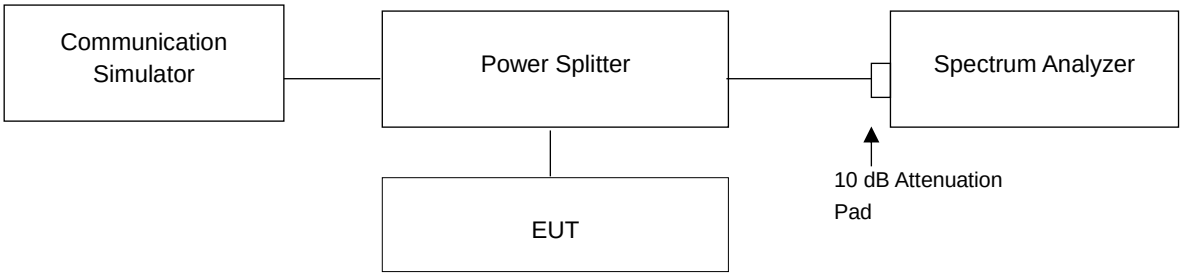
Limit line = -35 dBm + 2.04 dB =-32.96 dBm

4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.6.2 Test Setup



4.6.3 Test Procedures

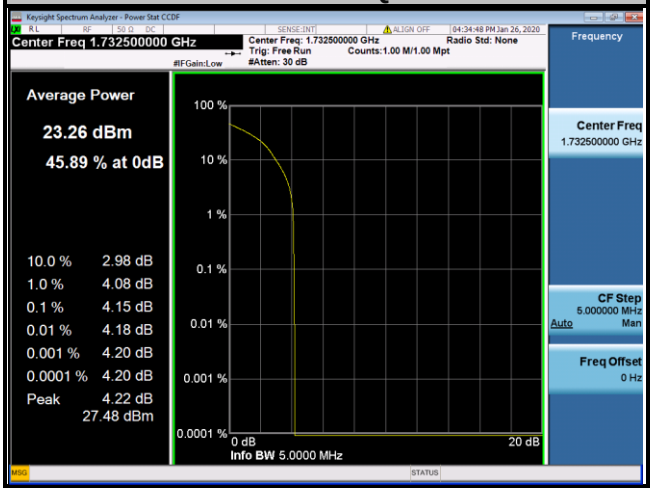
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

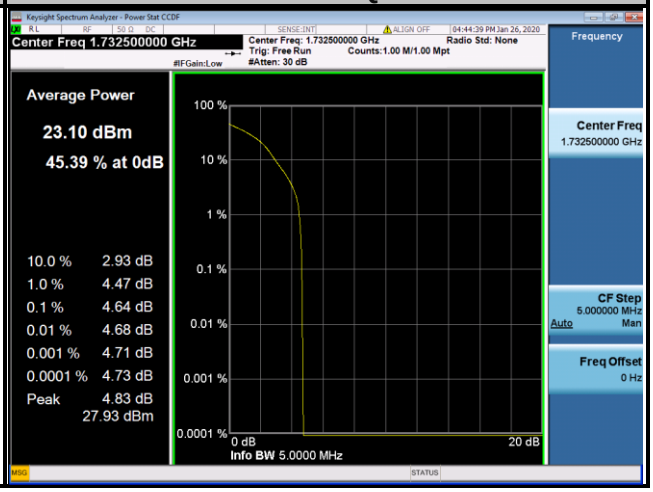
LTE Band 4							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
19957	1710.7	2.65	3.73	19965	1711.5	2.40	4.36
20175	1732.5	2.78	4.15	20175	1732.5	2.35	4.64
20393	1754.3	1.68	2.17	20385	1753.5	1.07	3.28

Spectrum Plot of Worst Value

1.4 MHz / 16QAM

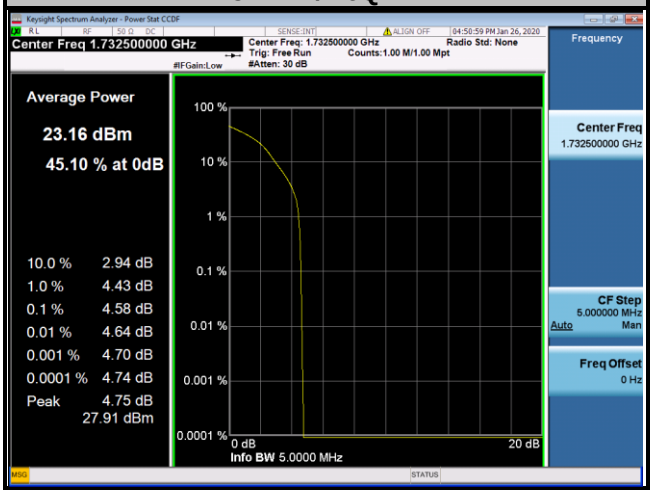


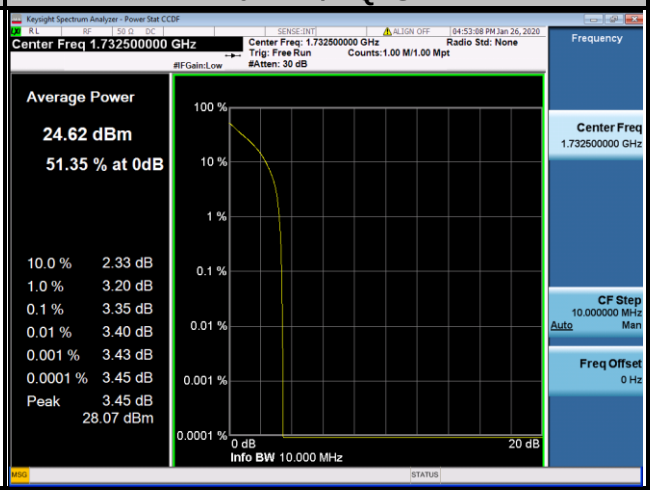
3 MHz / 16QAM



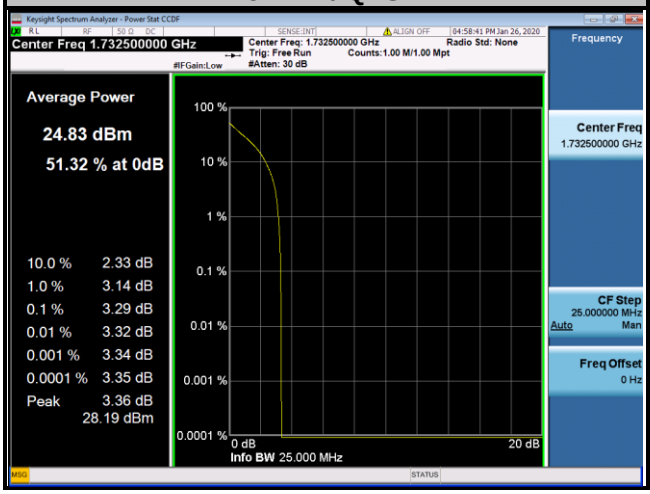
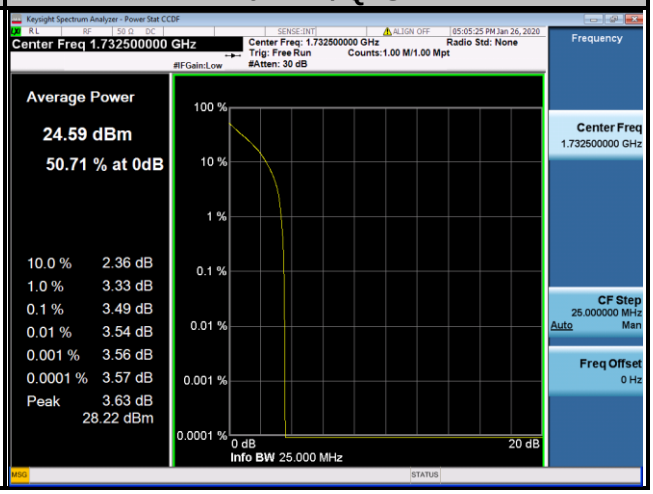
LTE Band 4						
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz		
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		QPSK	16QAM			QPSK
19975	1712.5	2.83	4.01	20000	1715.0	3.05
20175	1732.5	3.16	4.58	20175	1732.5	3.35
20375	1752.5	2.51	3.94	20350	1750.0	2.59

Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / QPSK

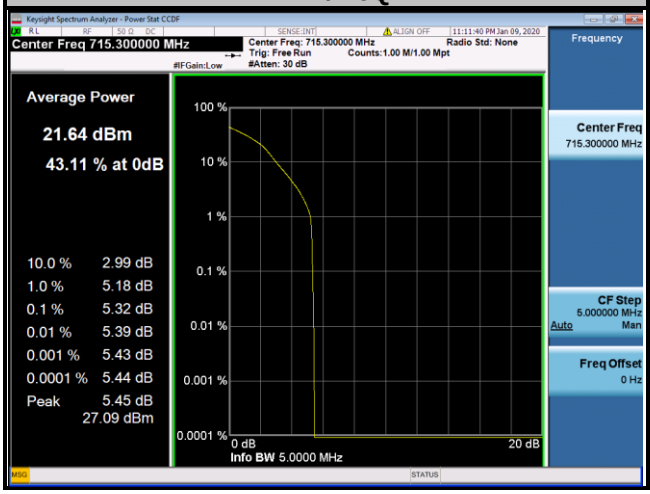
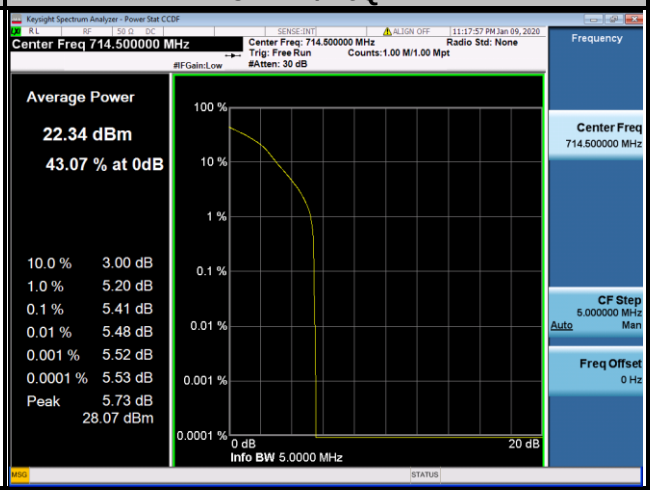




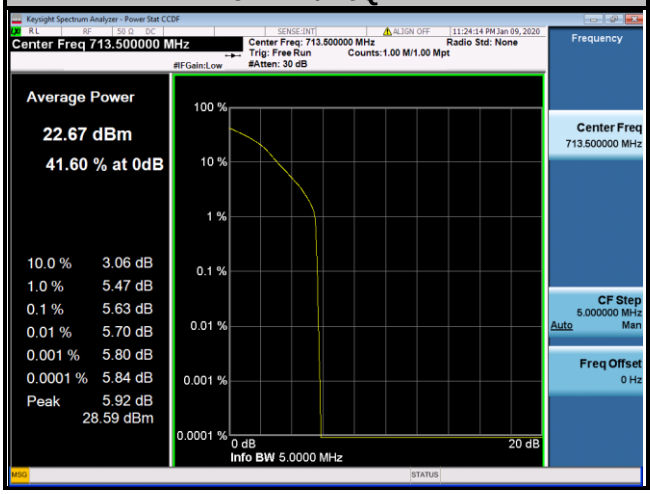
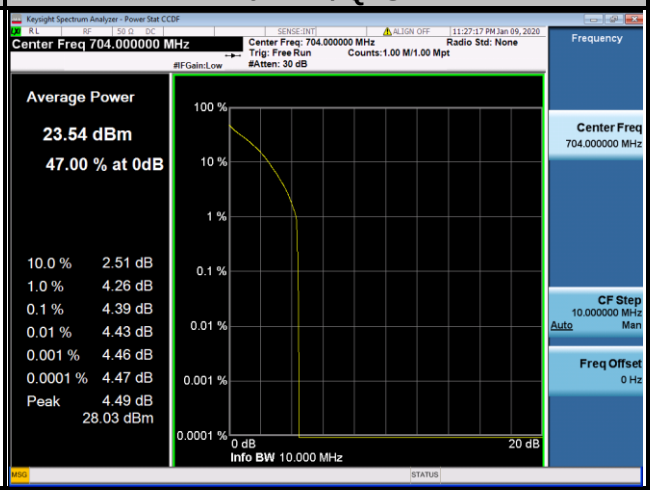
LTE Band 4					
Channel Bandwidth: 15 MHz			Channel Bandwidth: 20 MHz		
Channel	Frequency (MHz)	Peak to Average Ratio (dB)	Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		QPSK			QPSK
20025	1717.5	2.88	20050	1720.0	2.95
20175	1732.5	3.29	20175	1732.5	3.49
20325	1747.5	2.76	20300	1745.0	3.09

Spectrum Plot of Worst Value	
15 MHz / QPSK	20 MHz / QPSK
	

LTE Band 12							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
23017	699.7	4.28	5.25	23025	700.5	4.23	5.33
23095	707.5	3.79	5.00	23095	707.5	3.54	4.93
23173	715.3	4.03	5.32	23165	714.5	4.33	5.41

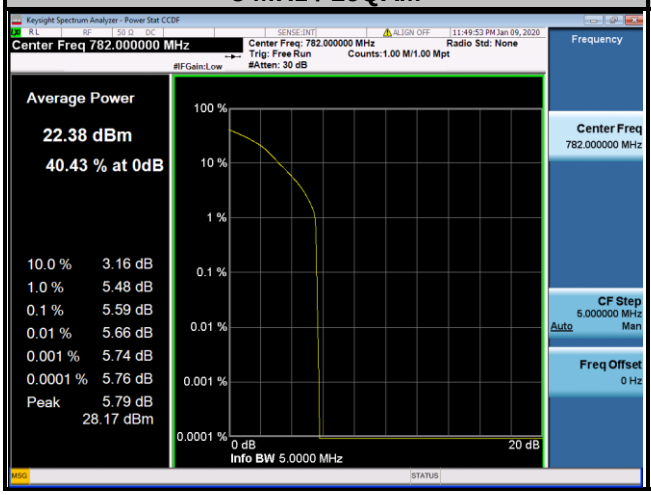
Spectrum Plot of Worst Value	
1.4 MHz / 16QAM	3 MHz / 16QAM
	

LTE Band 12						
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz		
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		QPSK	16QAM			QPSK
23035	701.5	4.36	5.25	23060	704.0	4.39
23095	707.5	3.69	4.68	23095	707.5	3.64
23155	713.5	4.76	5.63	23130	711.0	3.74

Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / QPSK
	

LTE Band 13						
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz		
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		QPSK	16QAM			QPSK
23205	779.5	3.50	4.76	23230	782.0	3.75
23230	782.0	4.34	5.59			
23255	784.5	4.19	5.28			

Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / QPSK



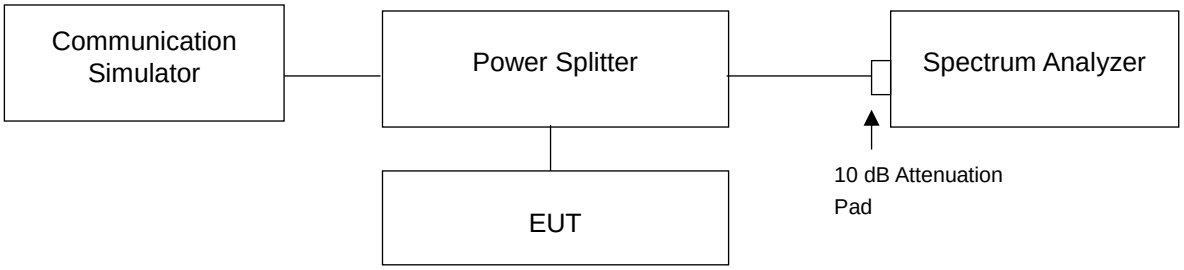
4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log (P) dB. The limit of emission is equal to -13 dBm.

For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm.

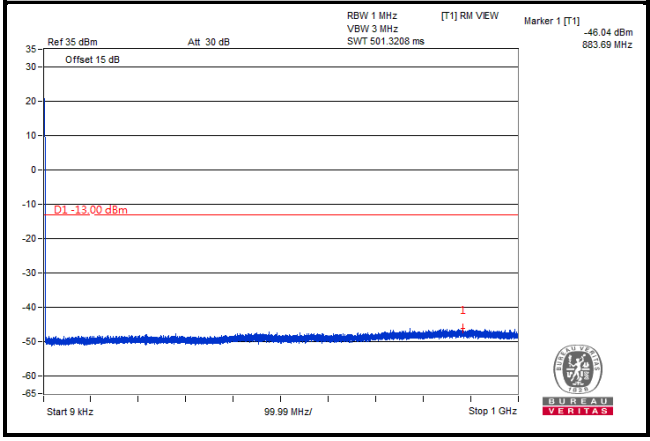
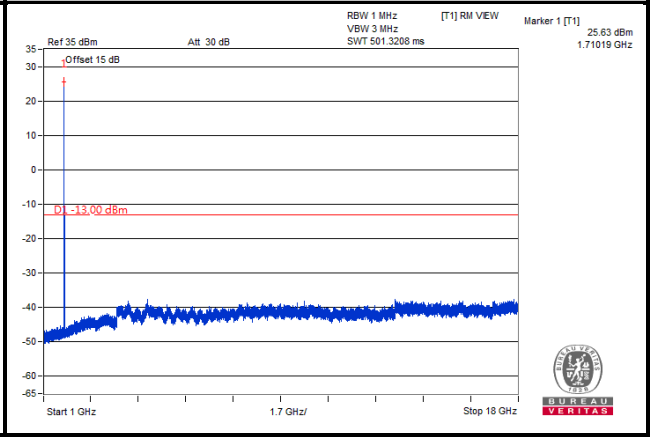
4.7.2 Test Setup



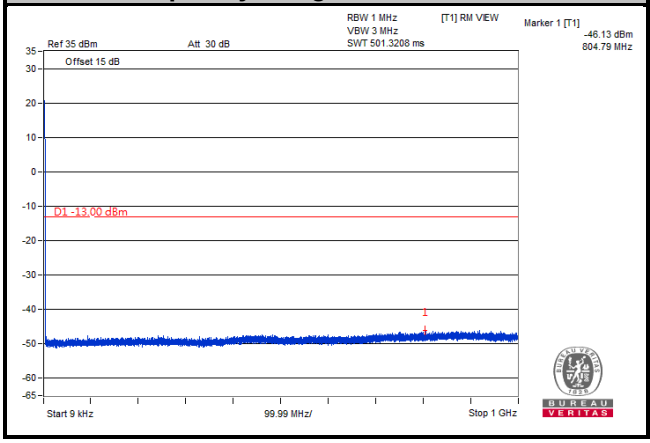
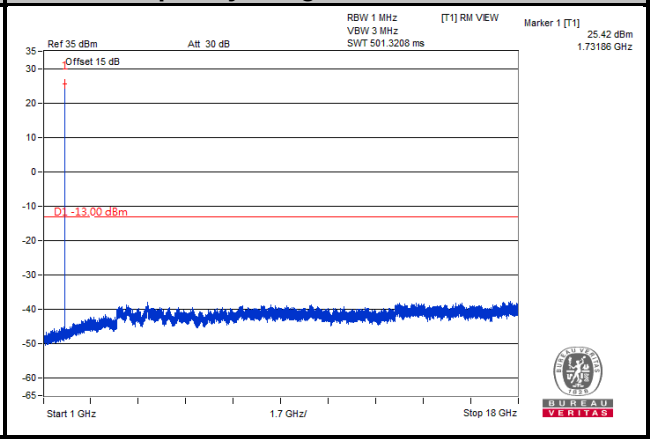
4.7.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz is used for (LTE Band 12 and Band 13) conducted emission measurement. Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for (LTE Band 4) conducted emission measurement.
c. Measuring frequency range is from 1 GHz to 7 GHz / 8 GHz / 18 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

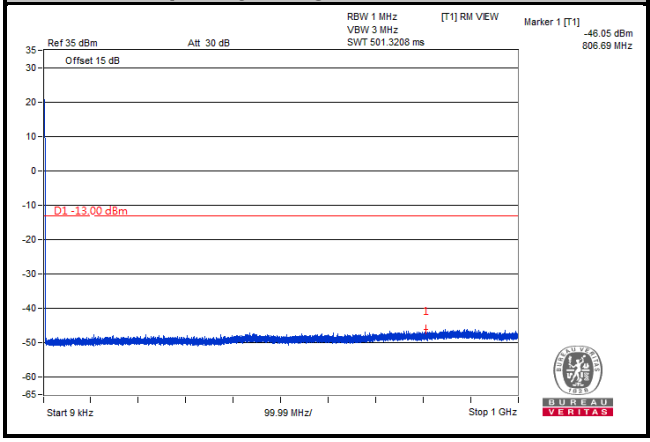
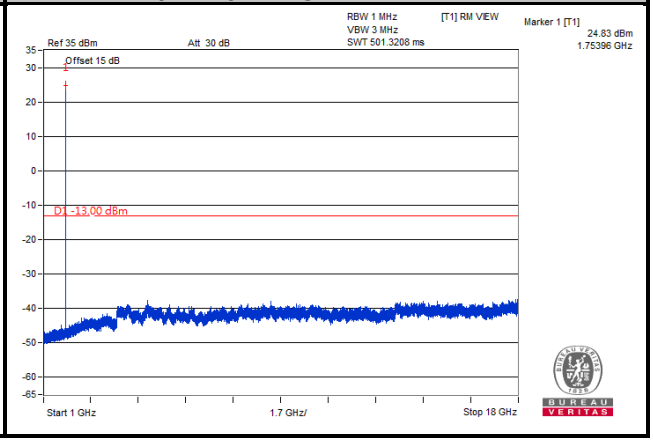
4.7.4 Test Results

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 19957	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

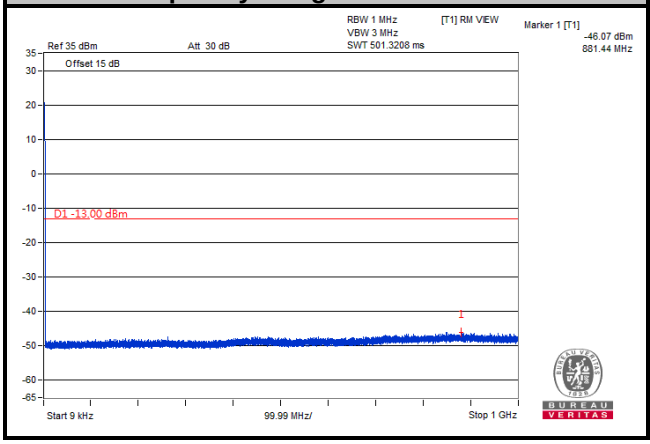
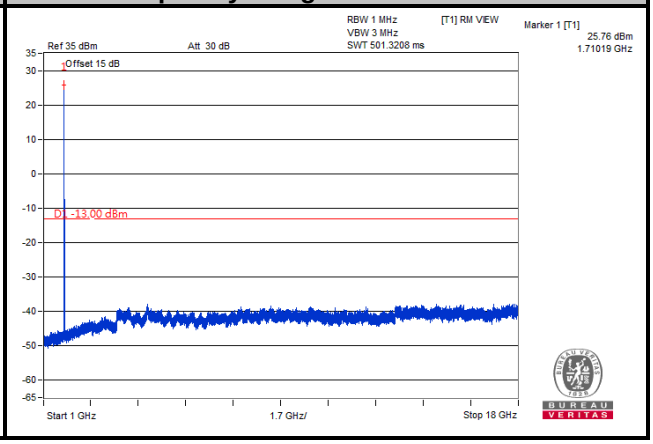
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

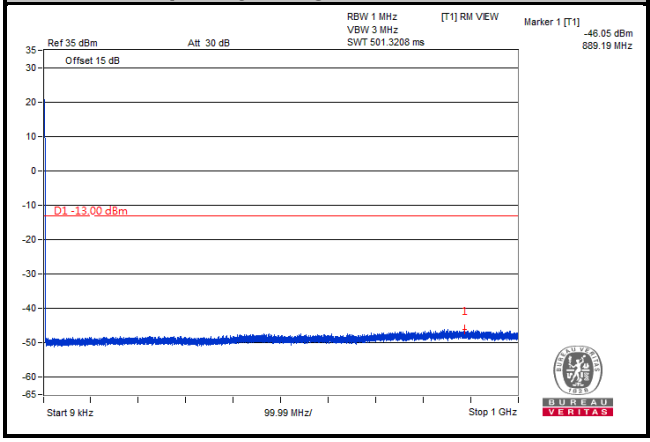
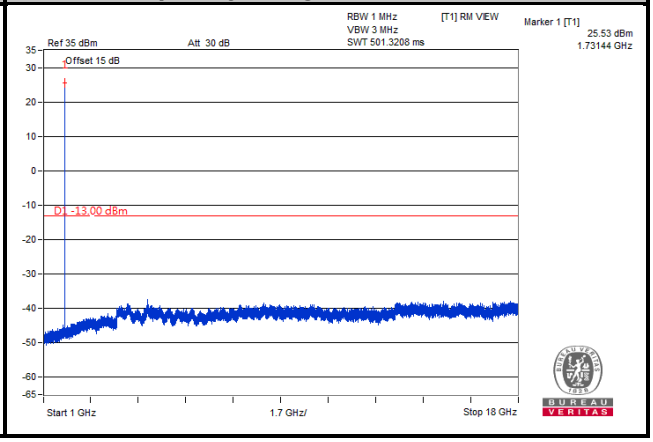
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 1.4 MHz	
Channel 20393	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

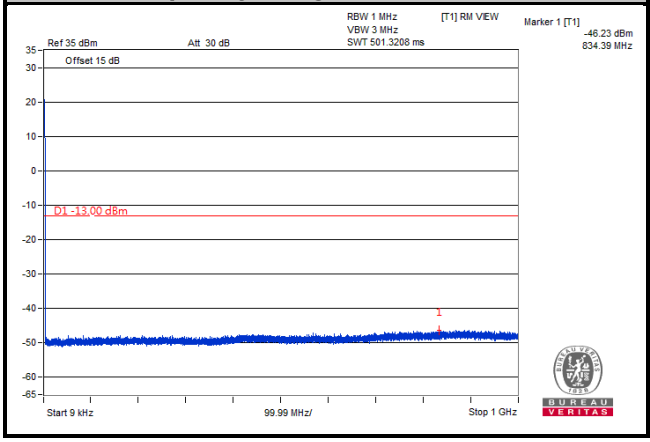
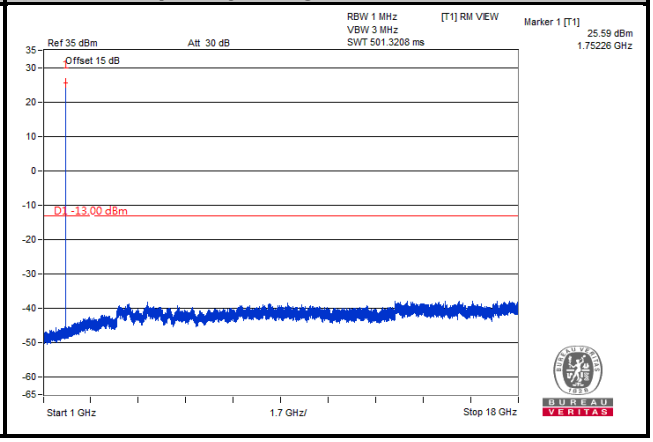
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 19965	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

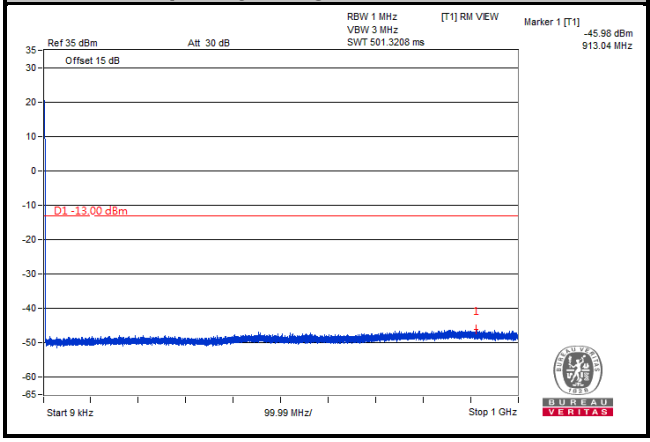
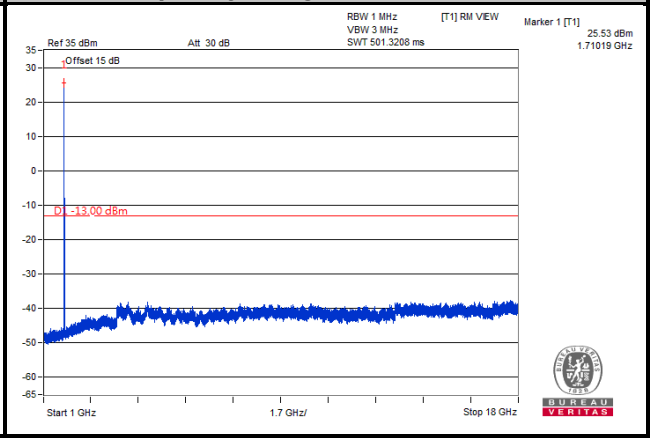
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

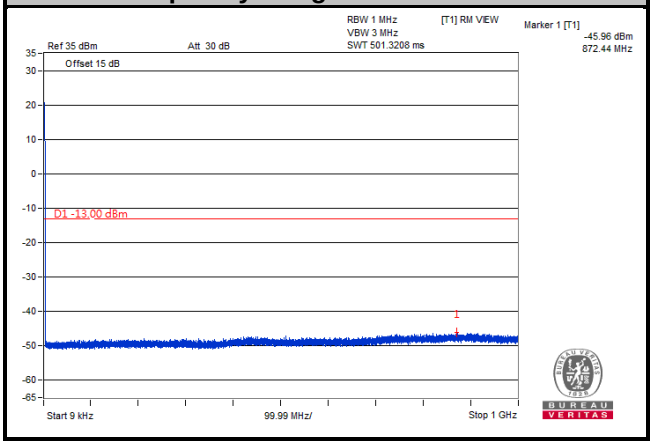
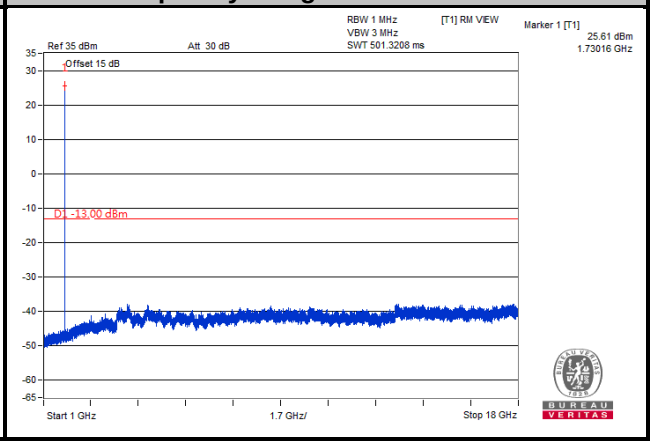
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 3 MHz	
Channel 20385	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

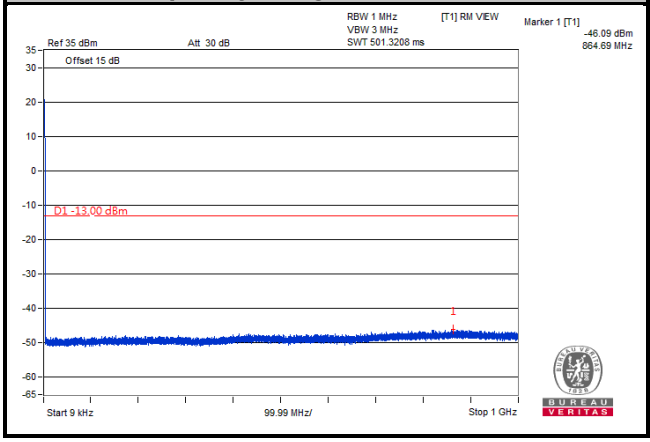
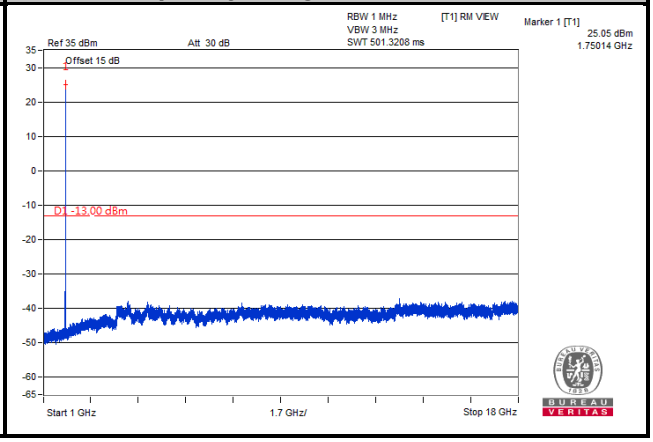
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 19975	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

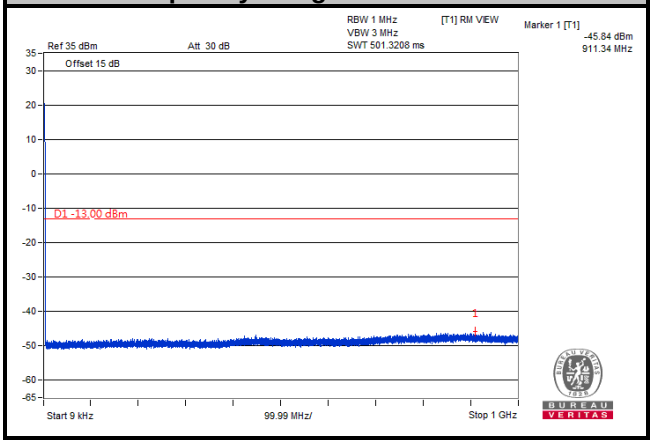
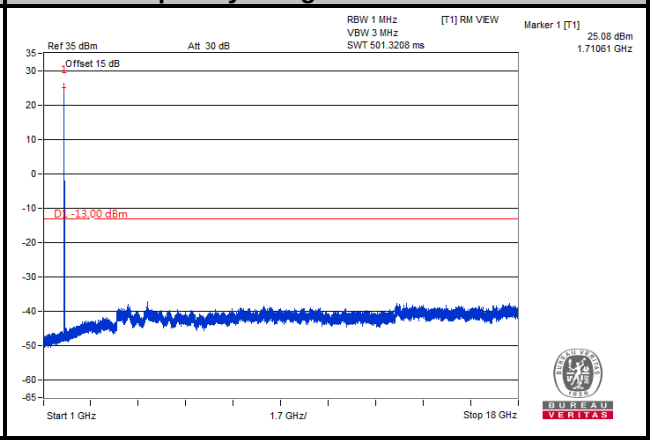
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

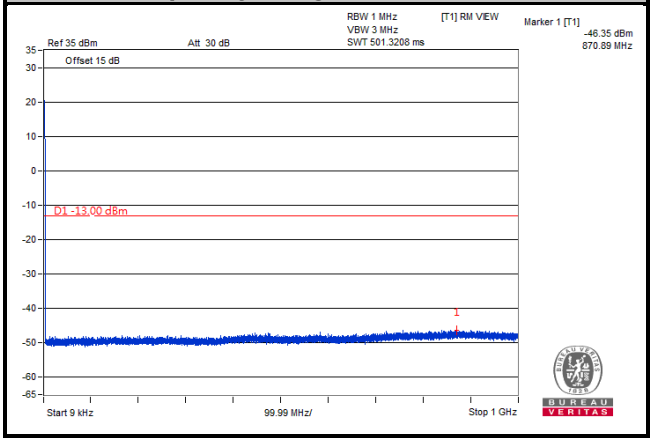
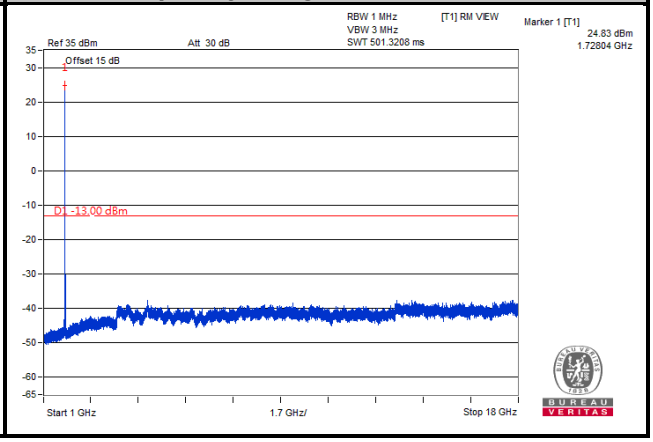
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 5 MHz	
Channel 20375	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

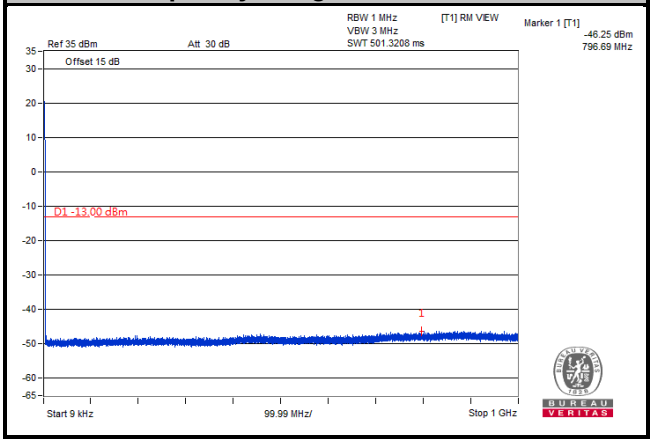
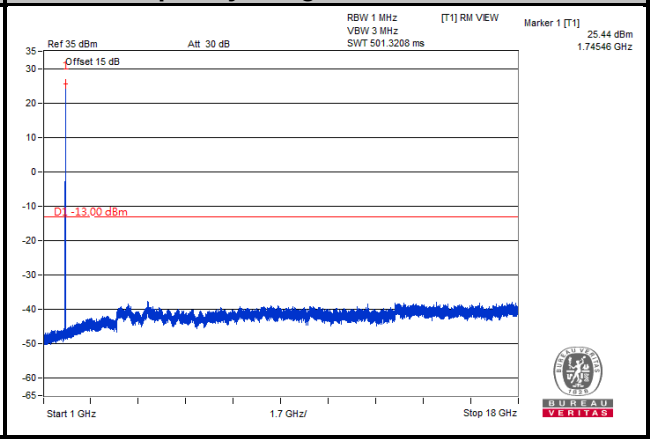
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20000	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

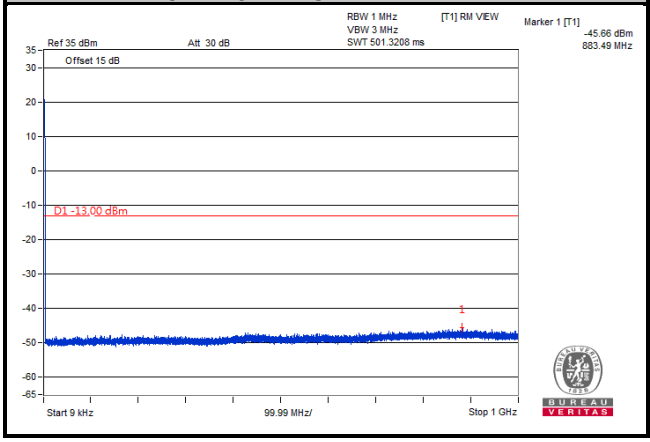
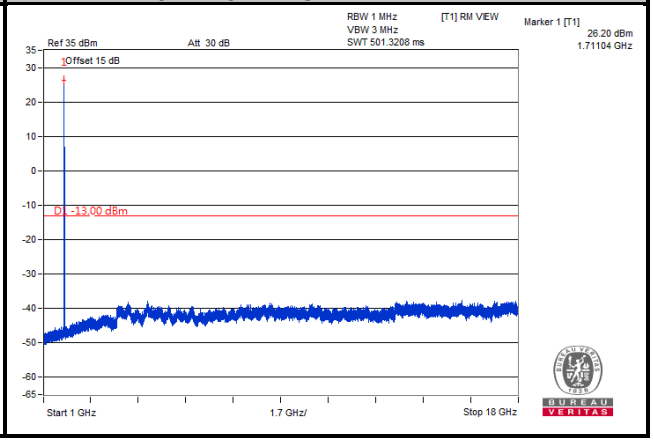
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

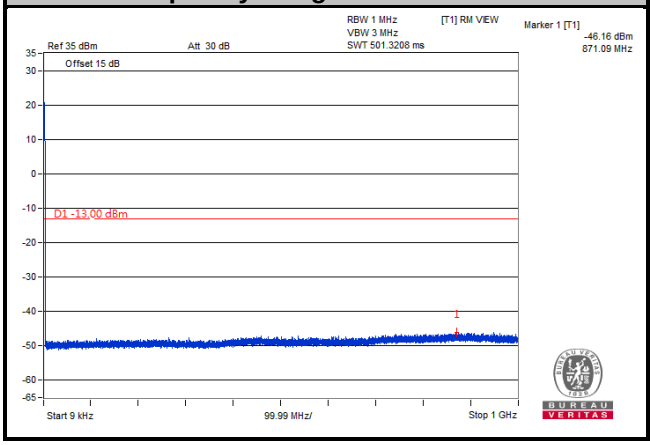
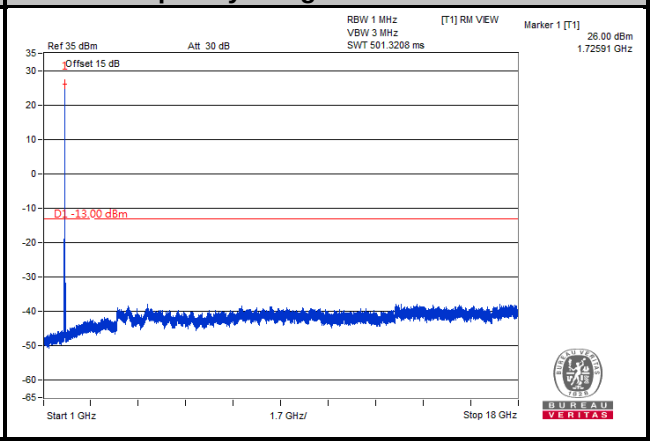
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 10 MHz	
Channel 20350	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

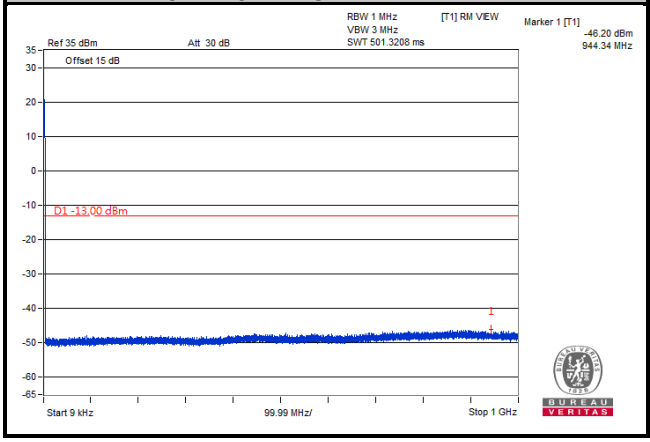
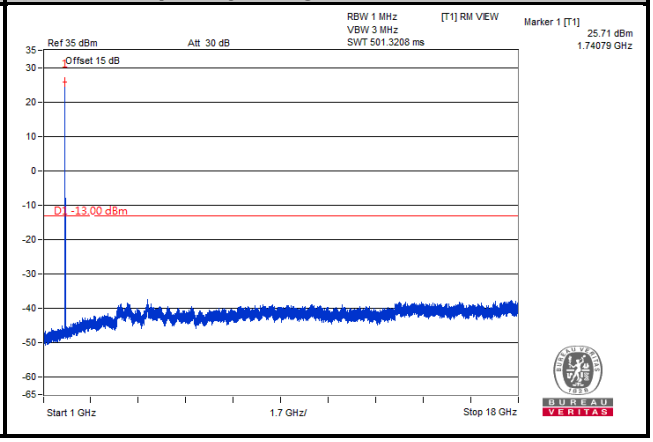
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20025	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

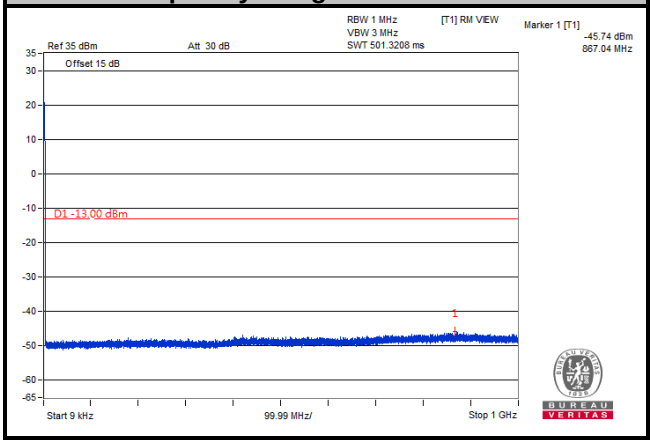
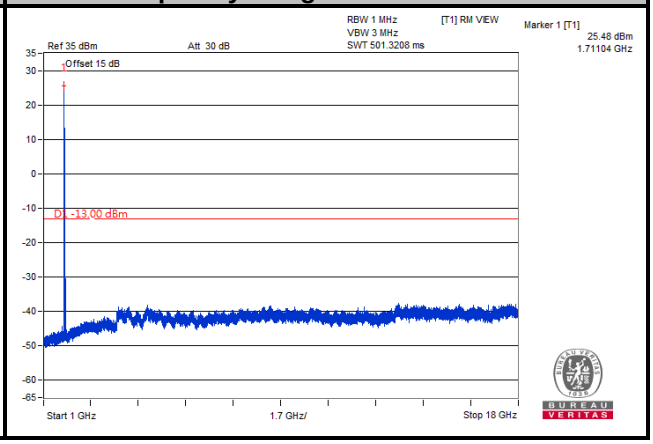
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

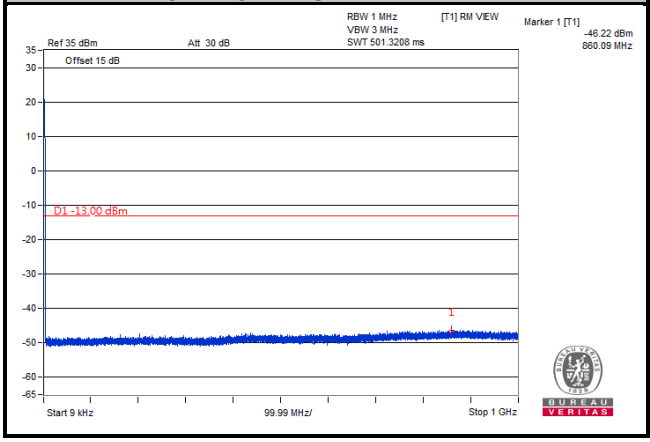
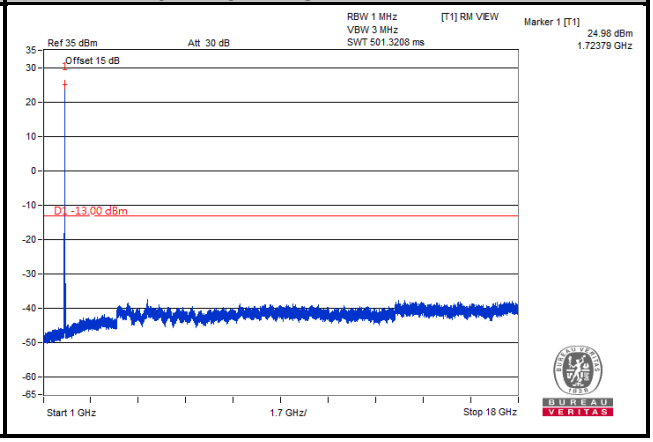
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 15 MHz	
Channel 20325	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

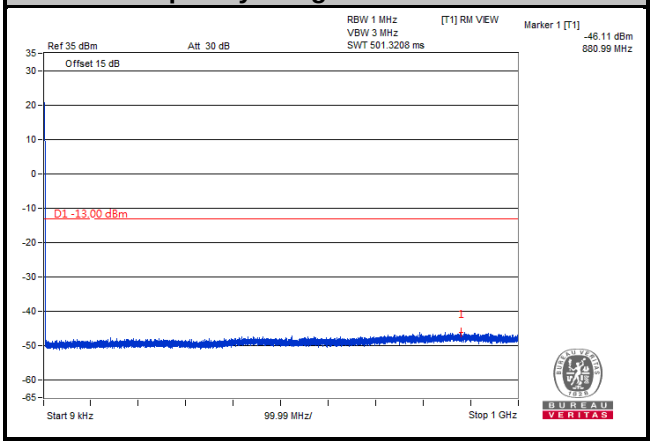
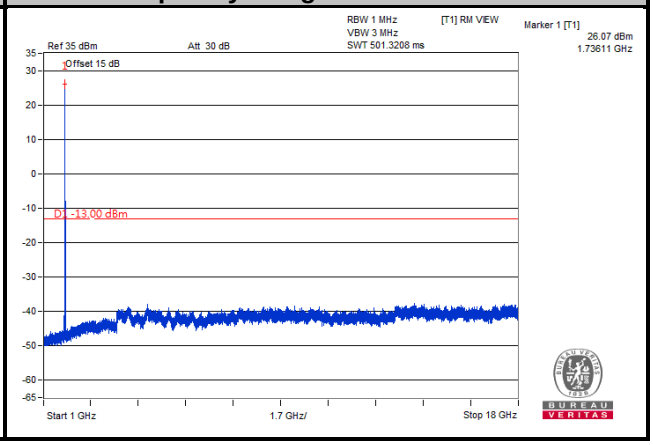
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20050	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

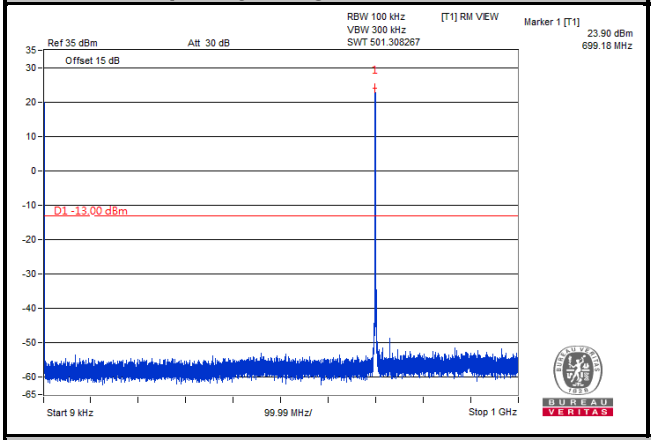
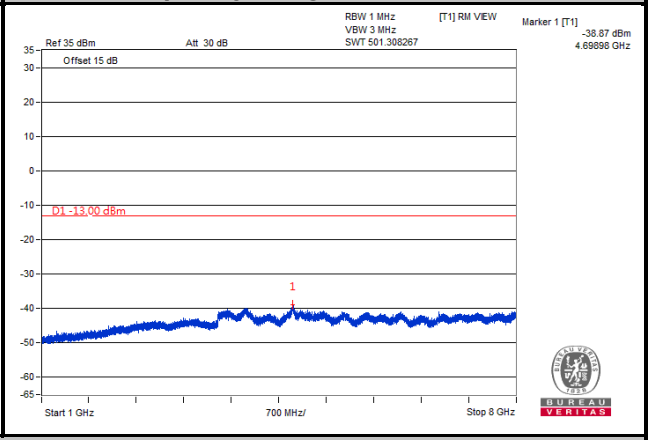
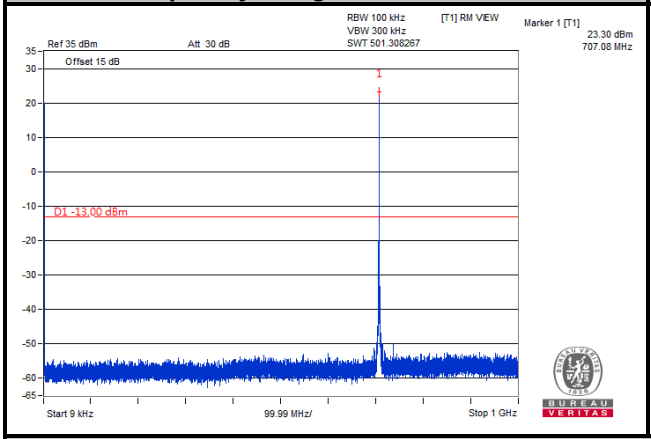
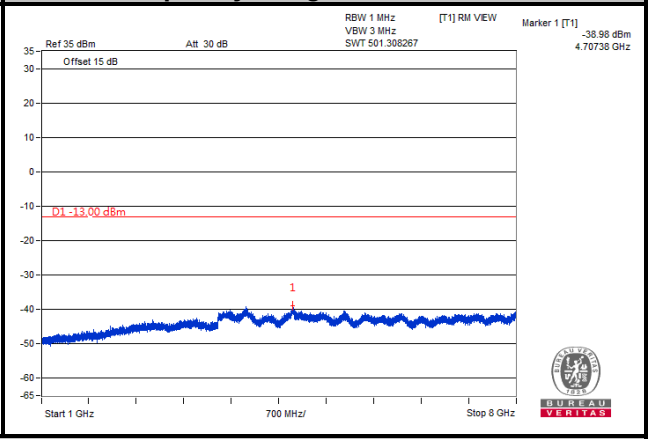
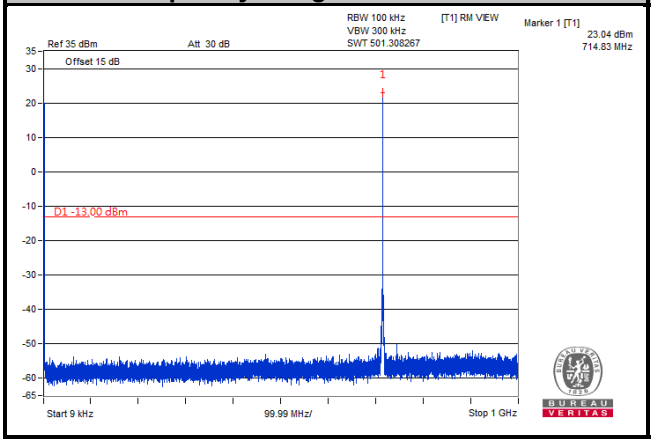
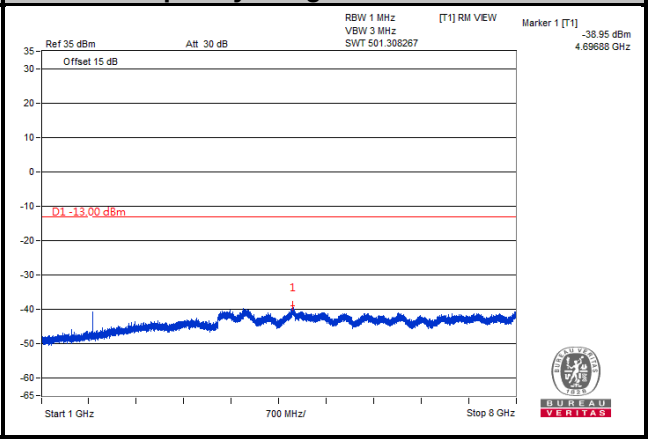
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20175	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

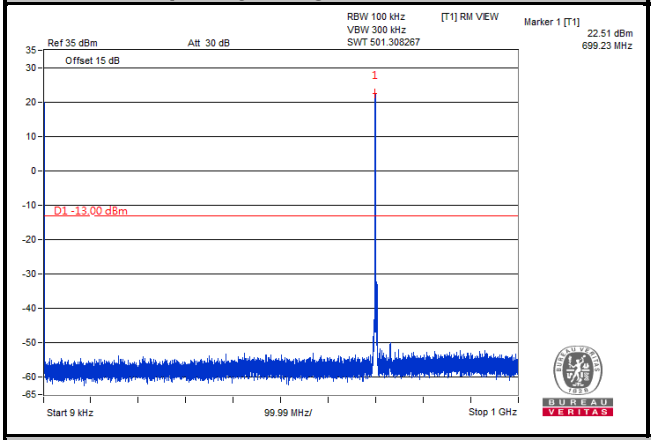
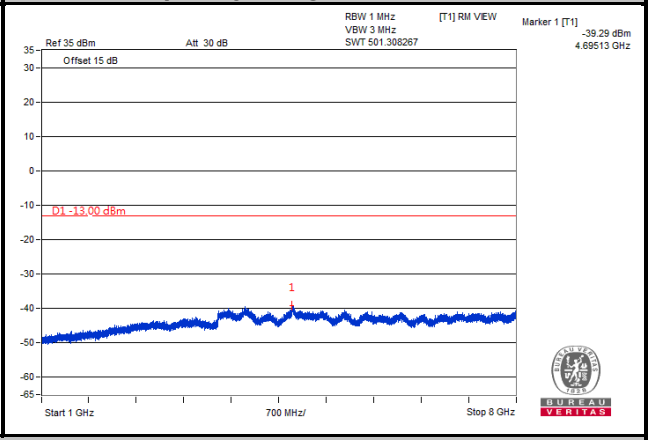
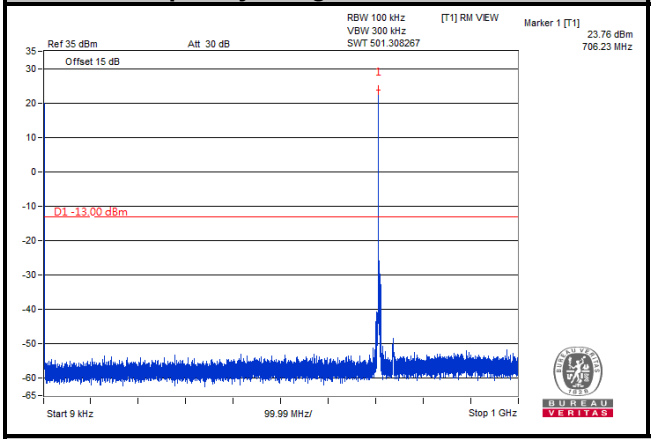
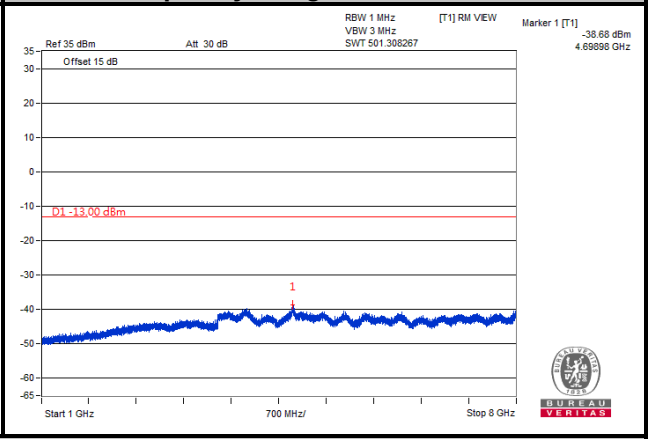
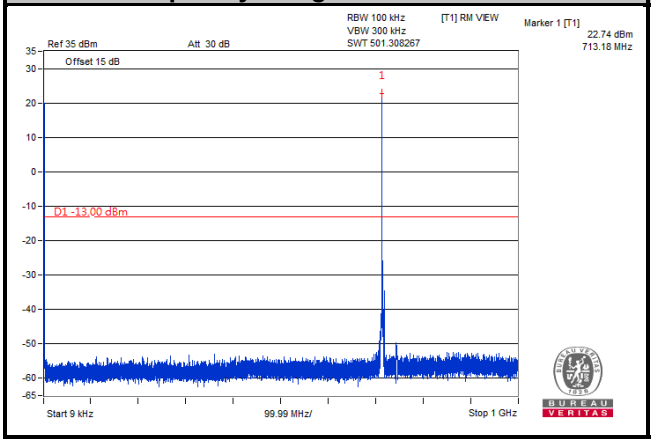
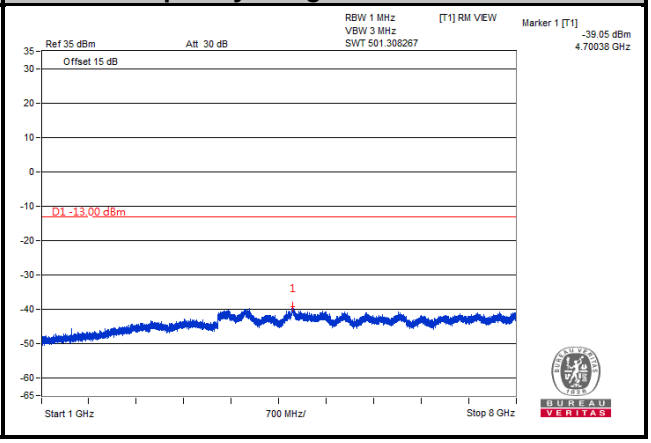
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 4	
Channel Bandwidth: 20 MHz	
Channel 20300	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 18 GHz
	

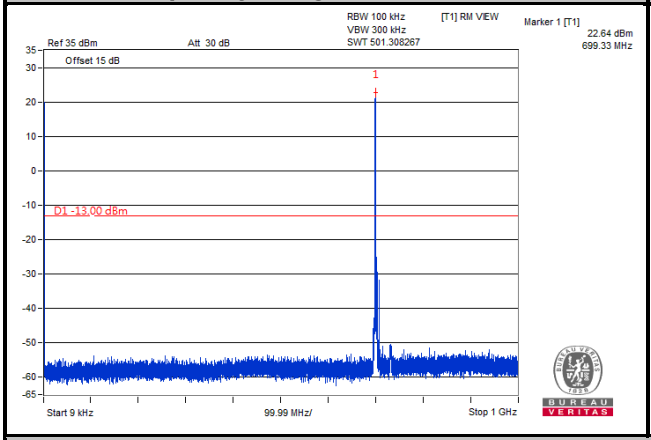
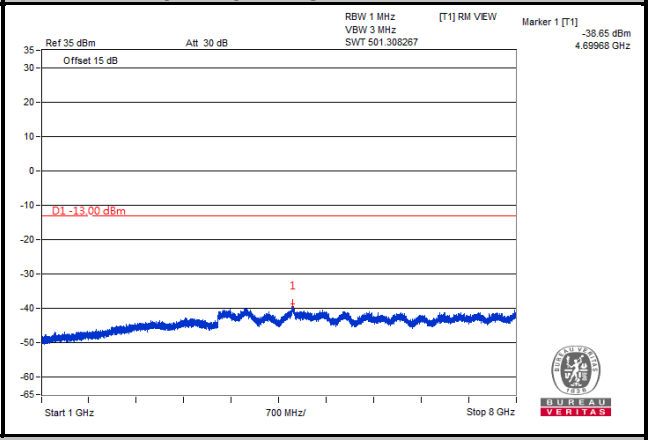
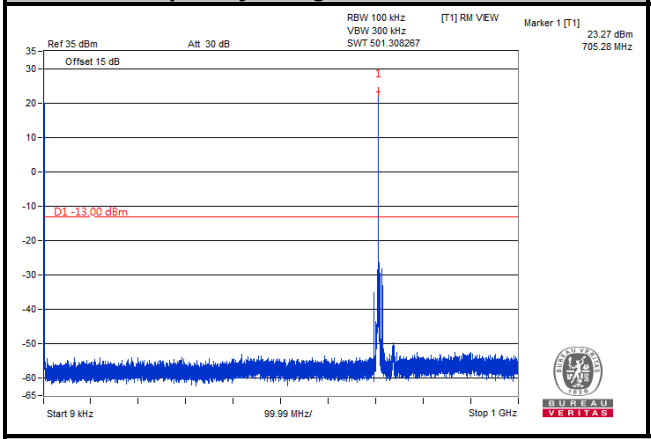
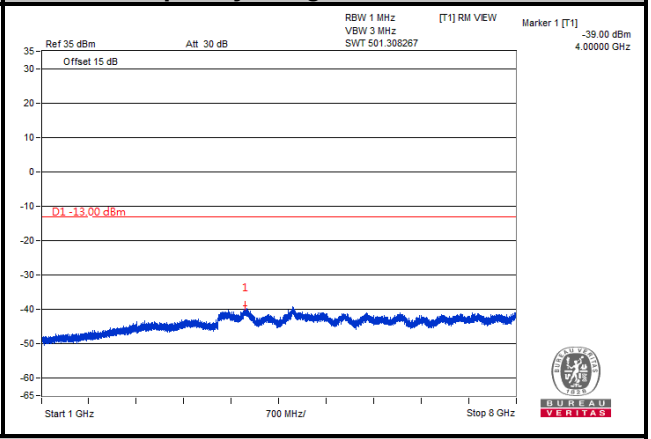
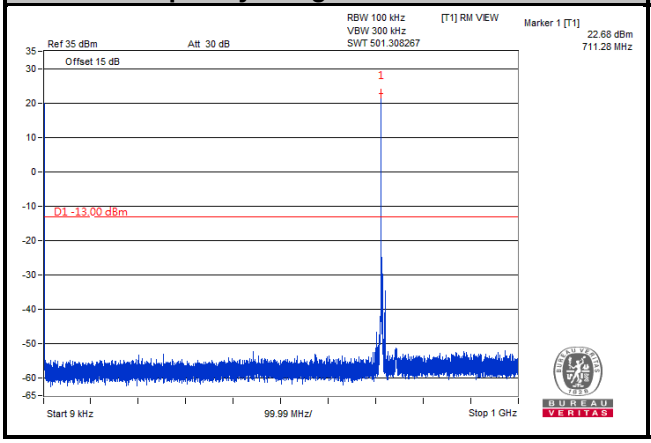
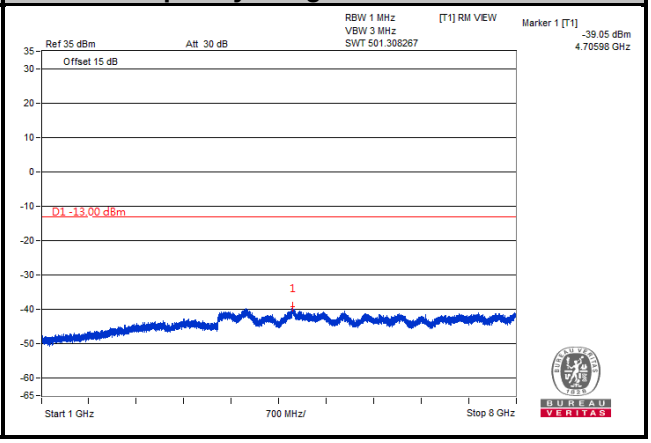
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 1.4 MHz	
Channel 23017	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23173	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	

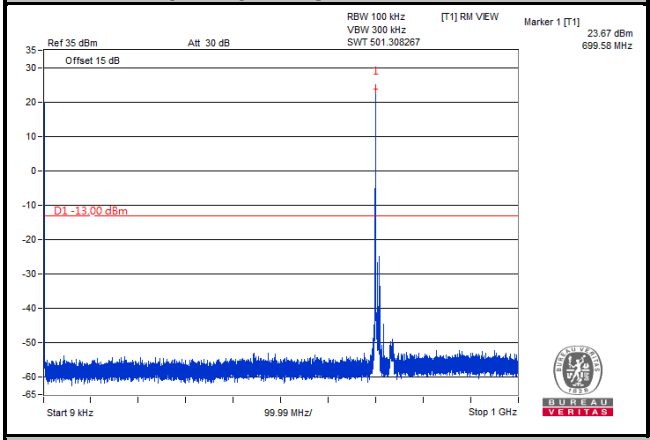
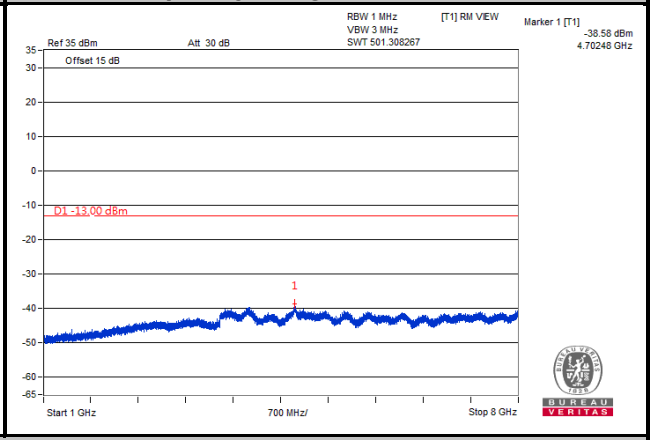
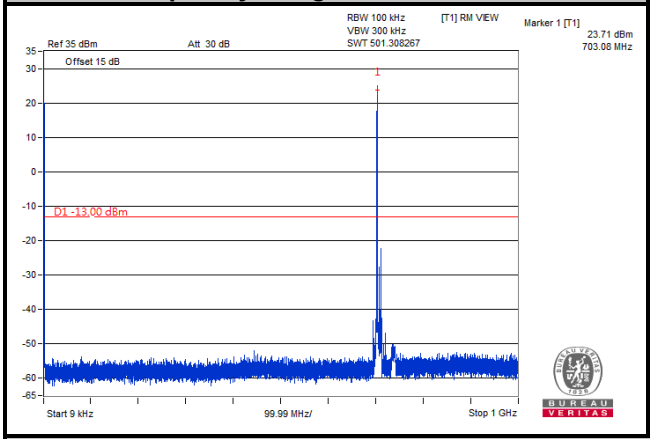
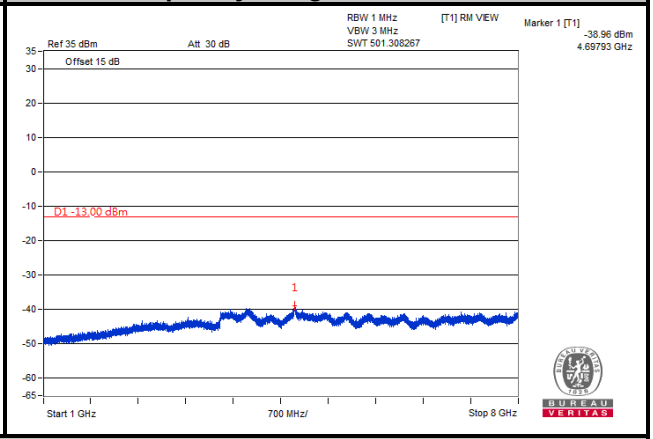
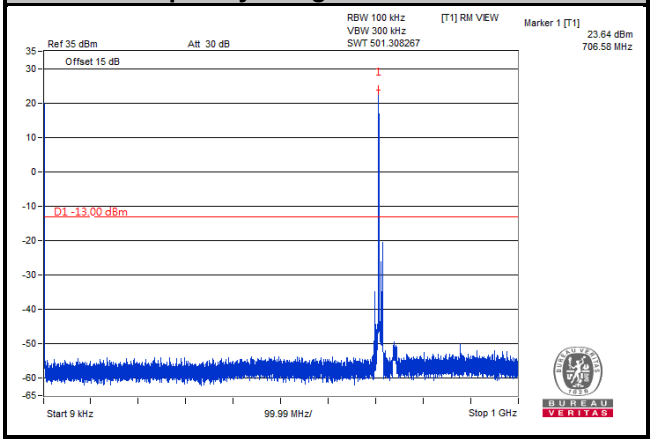
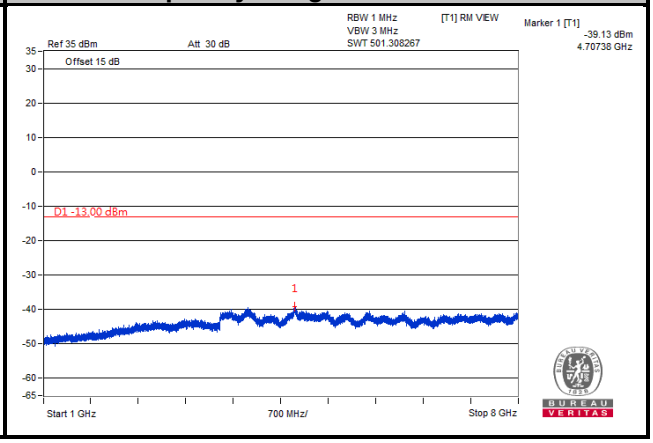
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 3 MHz	
Channel 23025	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23165	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	

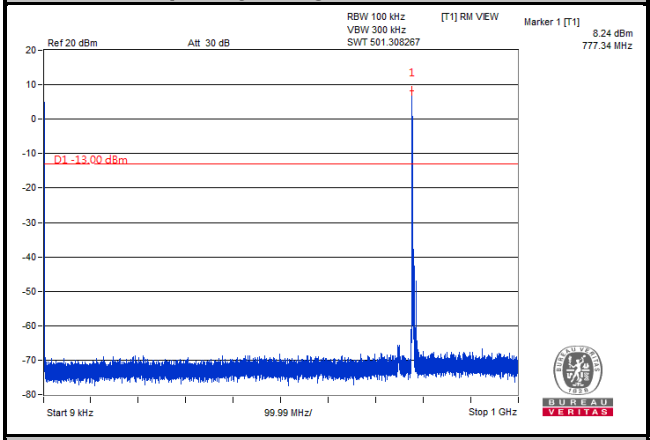
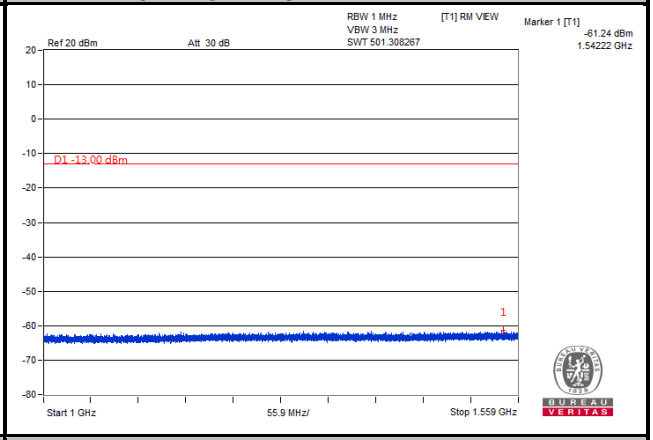
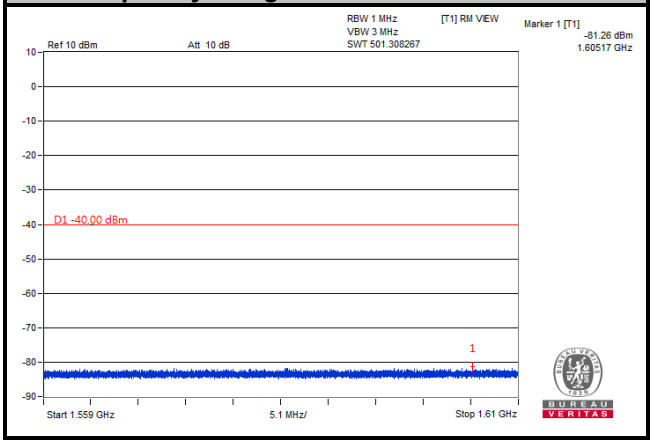
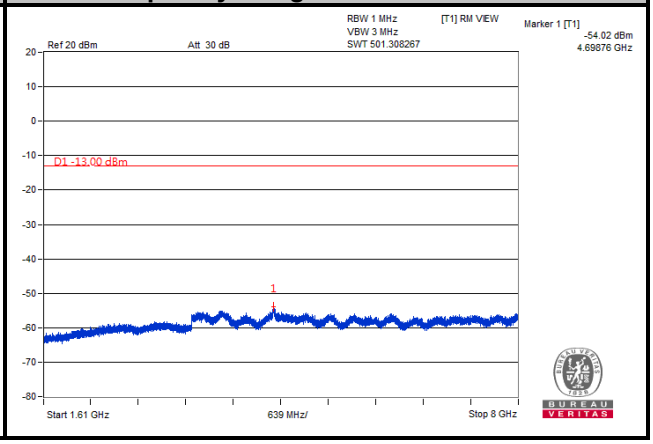
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 5 MHz	
Channel 23035	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23155	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	

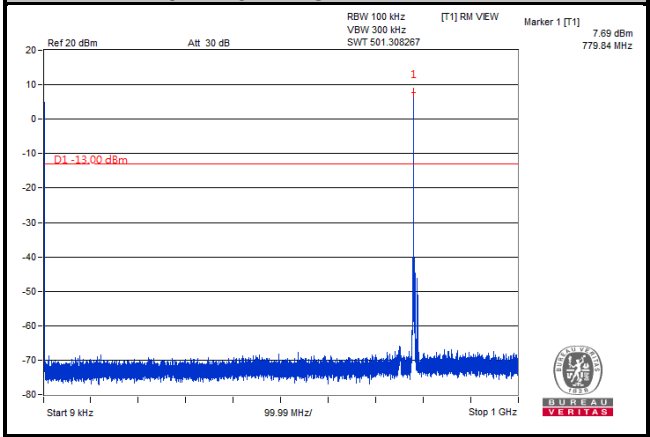
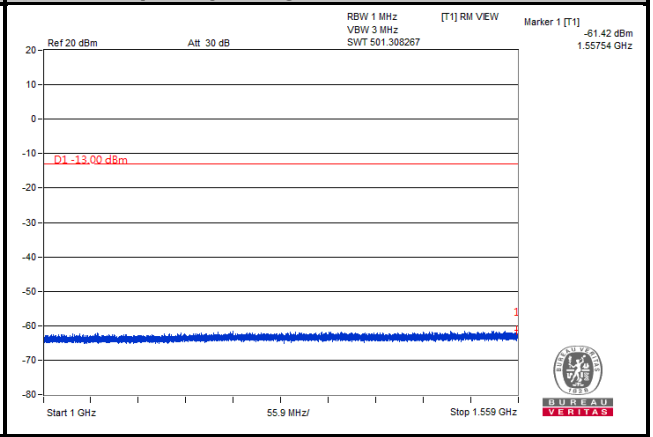
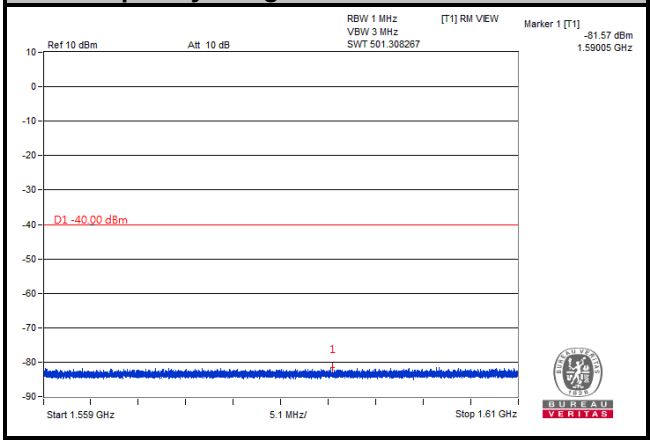
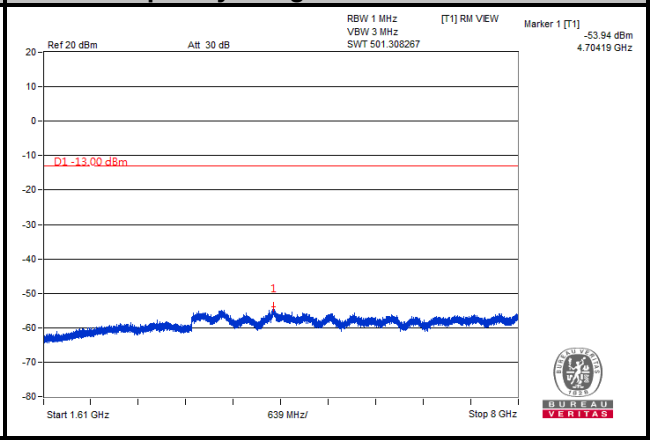
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 12	
Channel Bandwidth: 10 MHz	
Channel 23060	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23095	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	
Channel 23130	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 8 GHz
	

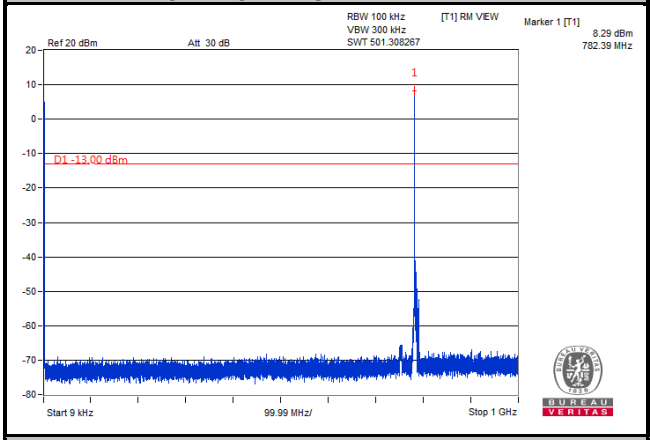
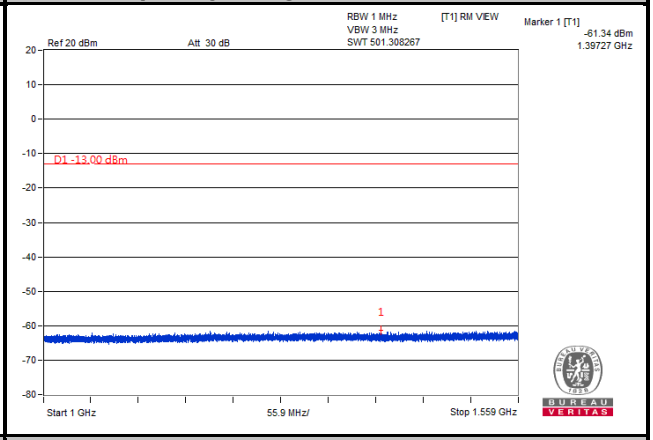
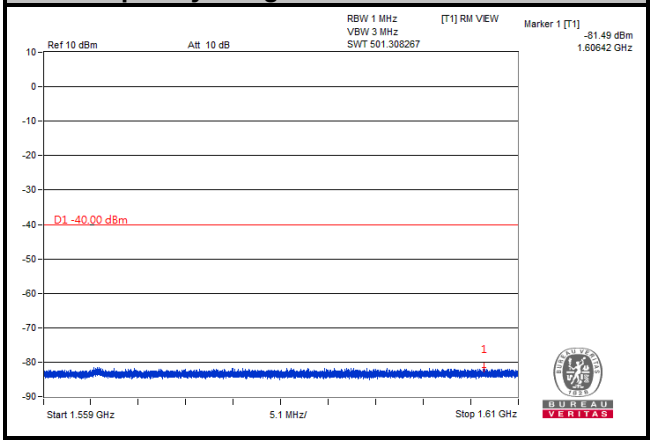
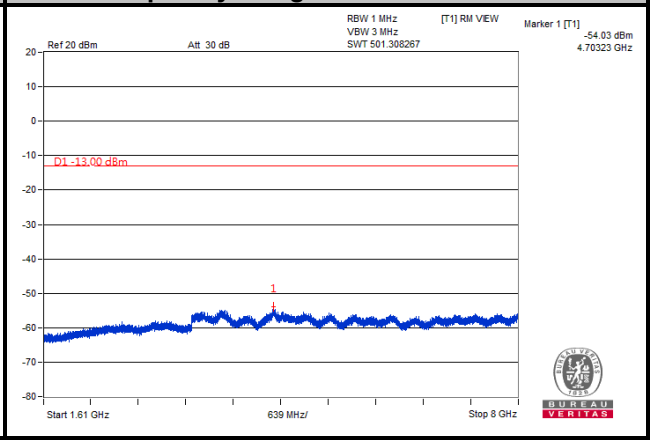
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 13	
Channel Bandwidth: 5 MHz	
Channel 23205	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 GHz
	

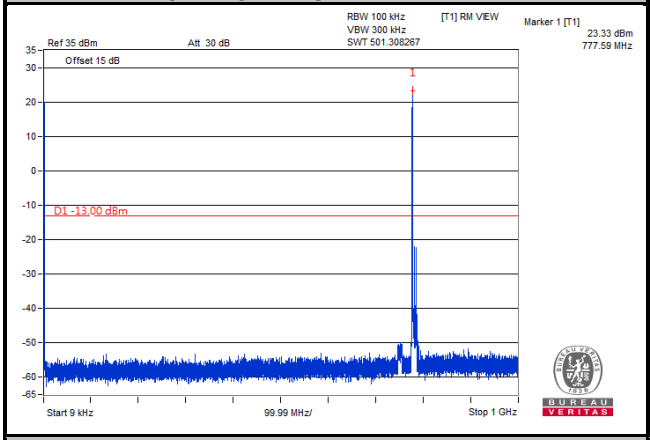
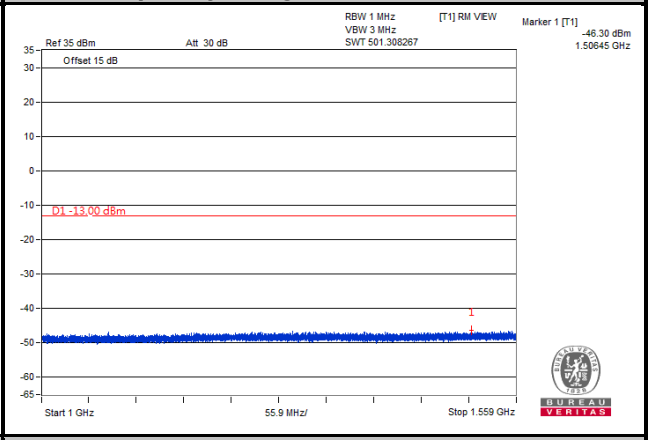
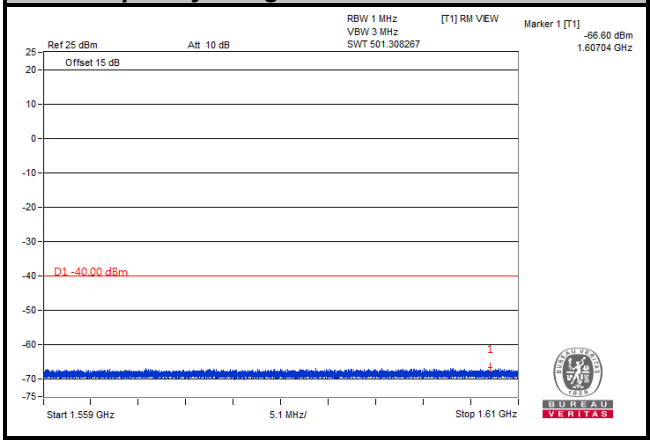
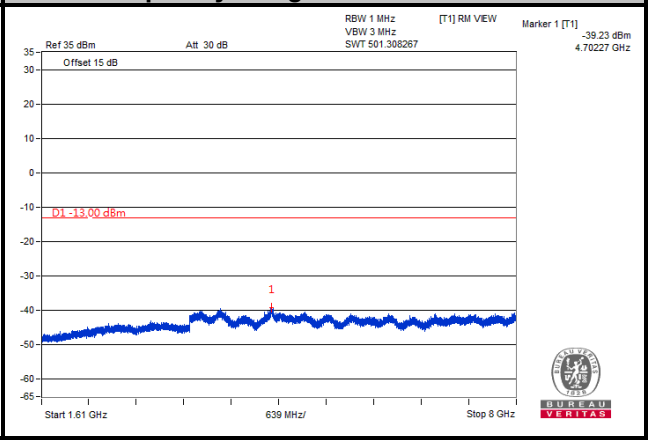
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 13	
Channel Bandwidth: 5 MHz	
Channel 23230	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 13	
Channel Bandwidth: 5 MHz	
Channel 23255	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 13	
Channel Bandwidth: 10 MHz	
Channel 23230	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 1.559 GHz
	
Frequency Range: 1.559 GHz ~ 1.61 GHz	Frequency Range: 1.61 GHz ~ 8 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

a. The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log (P) dB. The limit of emission is equal to -13 dBm.
b. For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm.

4.8.2 Test Procedure

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G.
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15 dB.

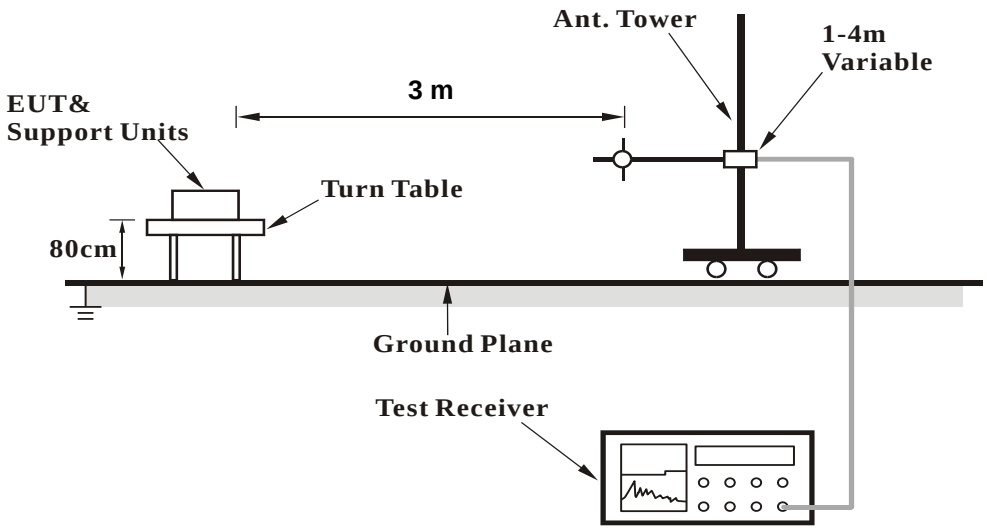
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.8.3 Deviation from Test Standard

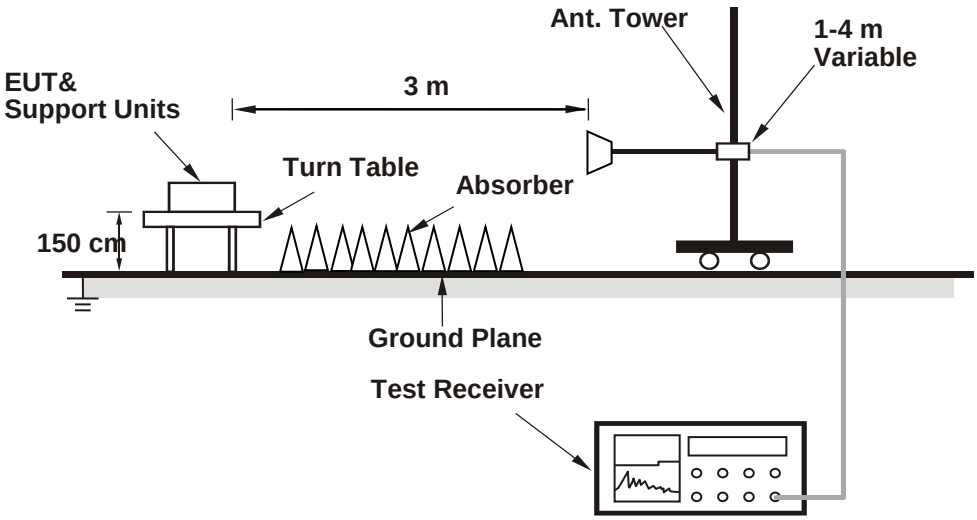
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

KDB 414788 OFS and Chamber Correlation Justification (For Radiated emission below 30MHz)

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

4.8.5 Test Results

LTE Band 4

Channel Bandwidth: 1.4 MHz / QPSK

Low Channel

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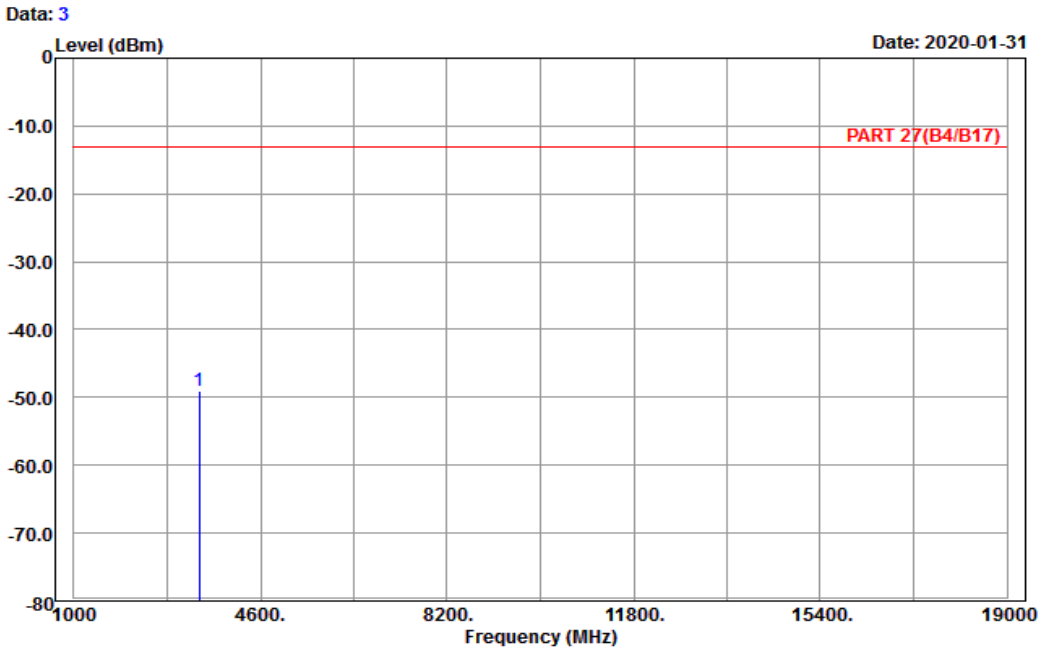
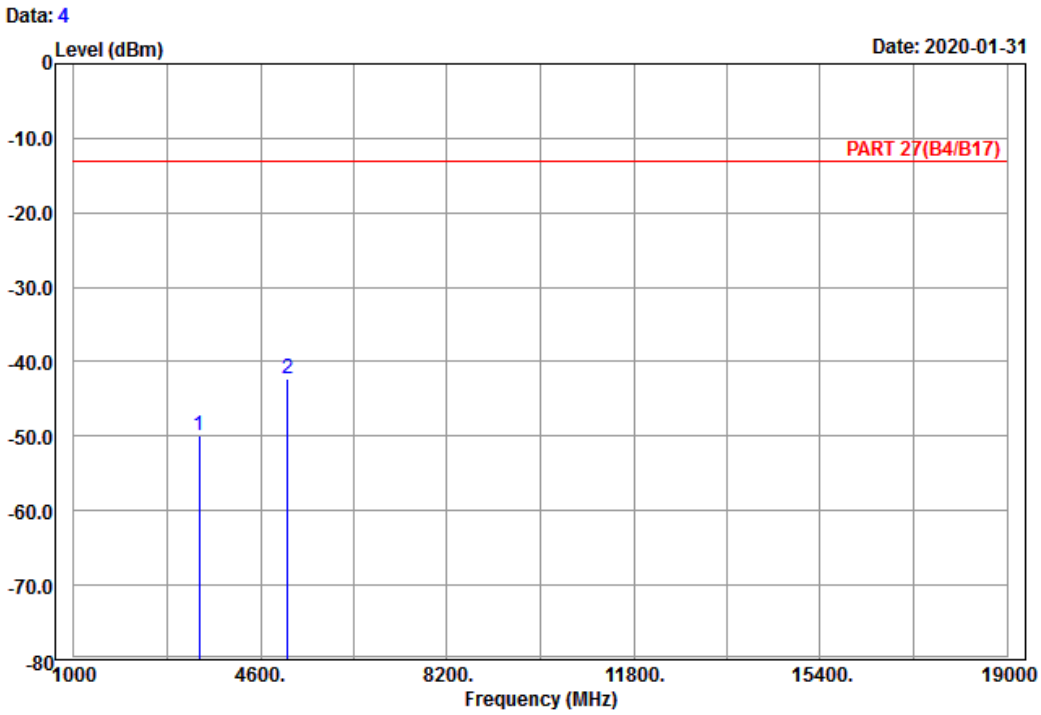



```
Site      : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark    : LTE_Band 4_Link_L-Ch
Tested by: Karl Lee
                        Read  Limit   Over
           Freq  Level  Level   Line  Limit Factor Remark
        _________ ______ ______ ______ ______ ______ ________
              MHz    dBm    dBm    dBm     dB     dB

  1 pp  3421.40 -48.97 -63.34 -13.00 -35.97  14.37 Peak
```

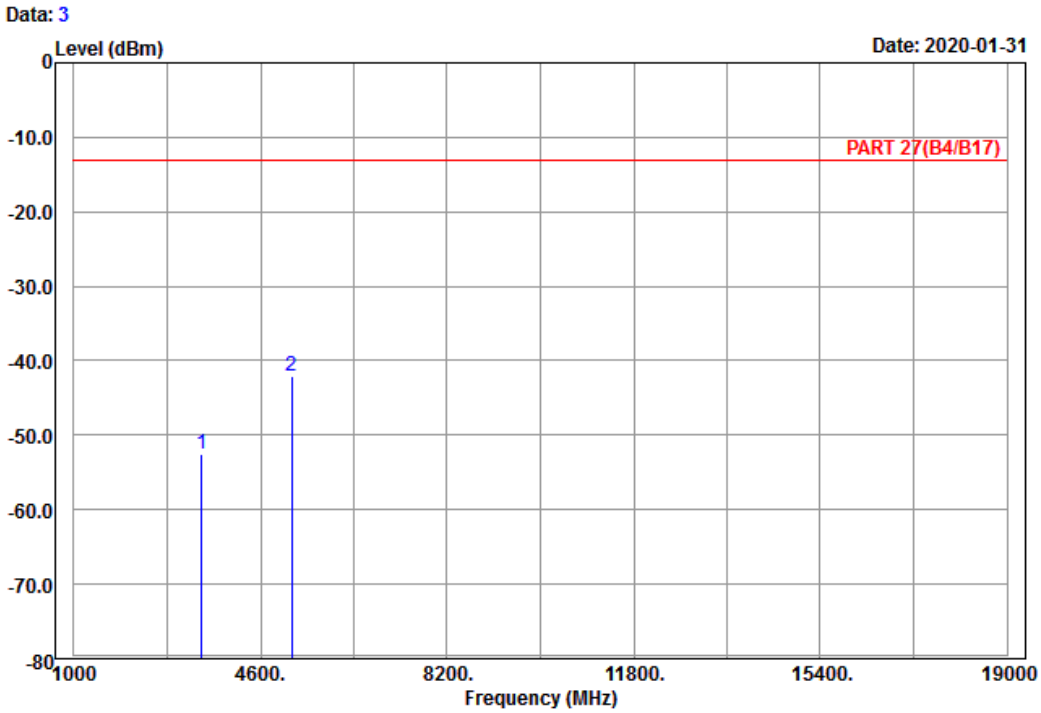


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3421.40	-49.87	-64.24	-13.00	-36.87	14.37	Peak
2 pp	5132.10	-42.38	-62.19	-13.00	-29.38	19.81	Peak

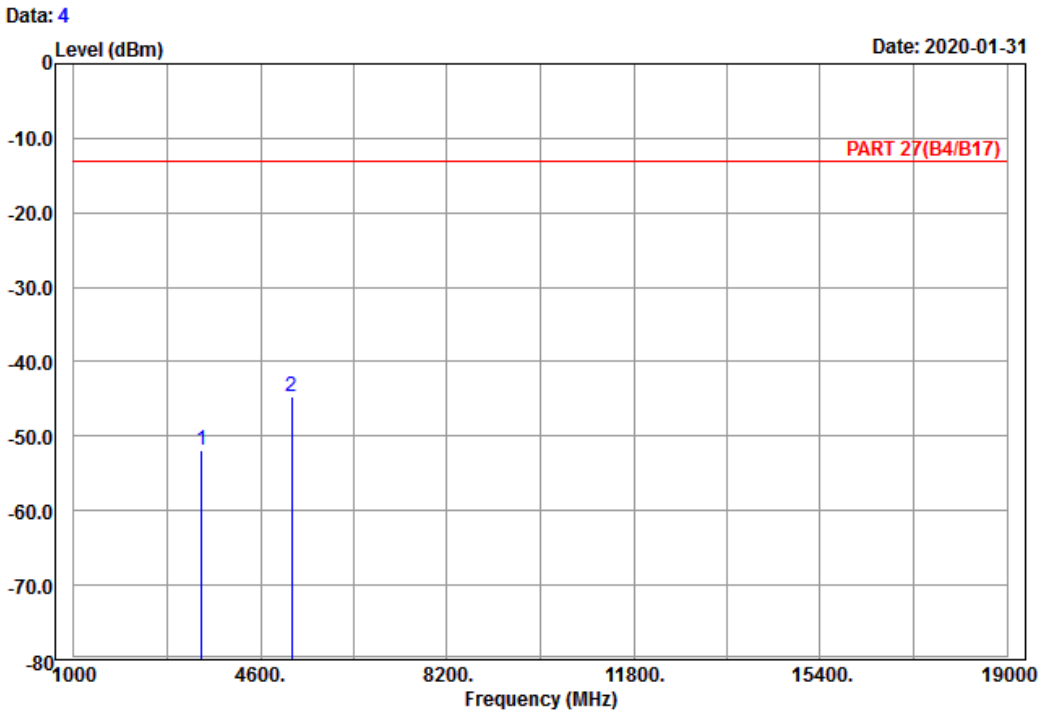
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-52.51	-66.85	-13.00	-39.51	14.34	Peak
2 pp	5197.50	-42.03	-62.15	-13.00	-29.03	20.12	Peak

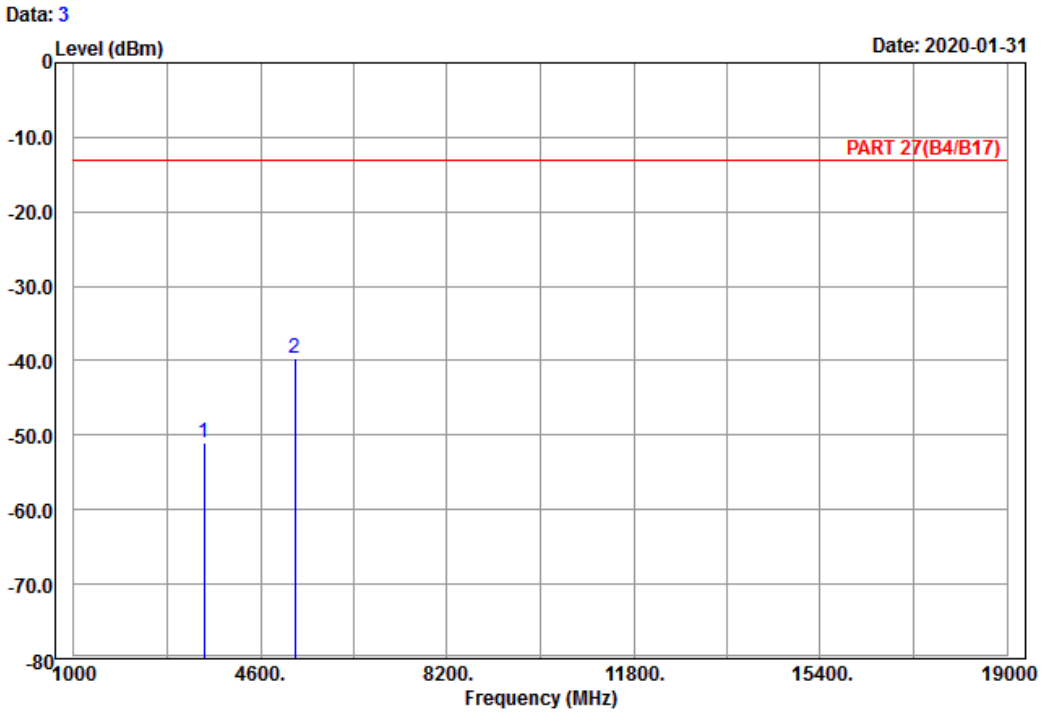


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-51.87	-66.21	-13.00	-38.87	14.34	Peak
2 pp	5197.50	-44.69	-64.81	-13.00	-31.69	20.12	Peak

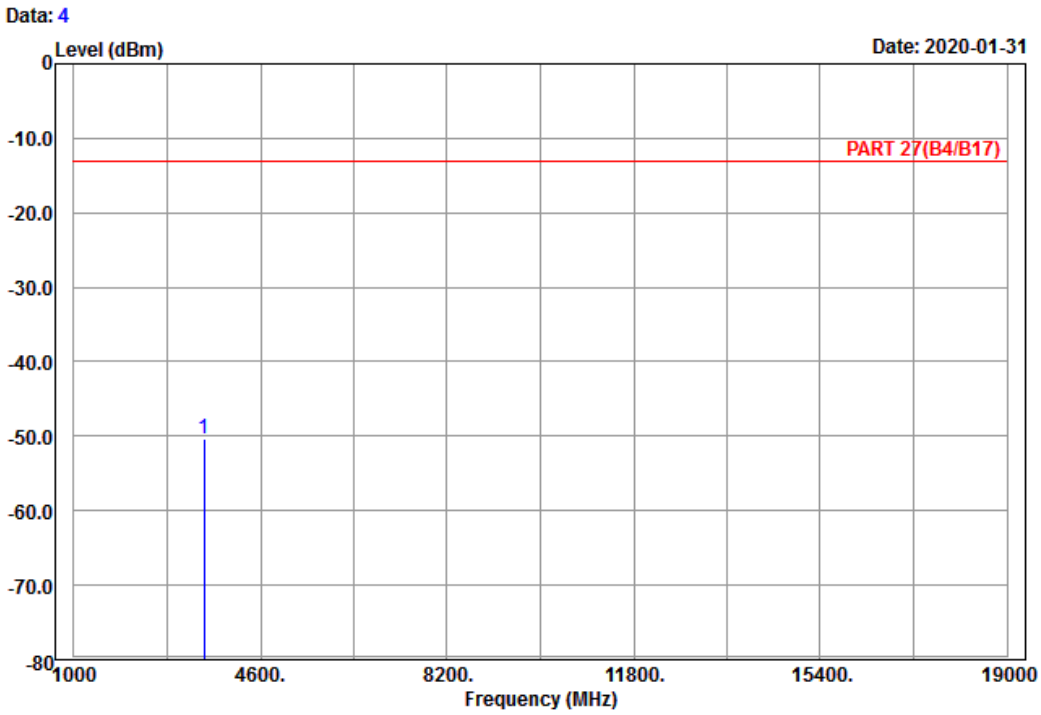
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3508.60	-50.99	-65.27	-13.00	-37.99	14.28	Peak
2 pp	5262.90	-39.73	-59.93	-13.00	-26.73	20.20	Peak

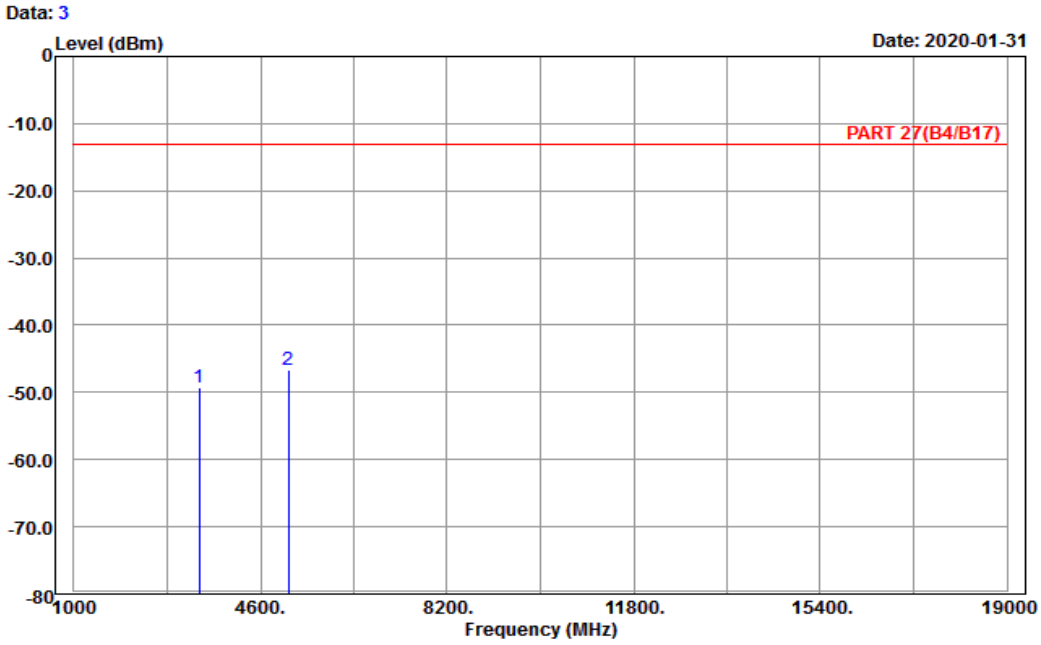


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_H-Ch
Tested by: Karl Lee

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
		MHz	dBm	dBm	dBm	dB	dB	
1	pp	3508.60	-50.31	-64.59	-13.00	-37.31	14.28	Peak

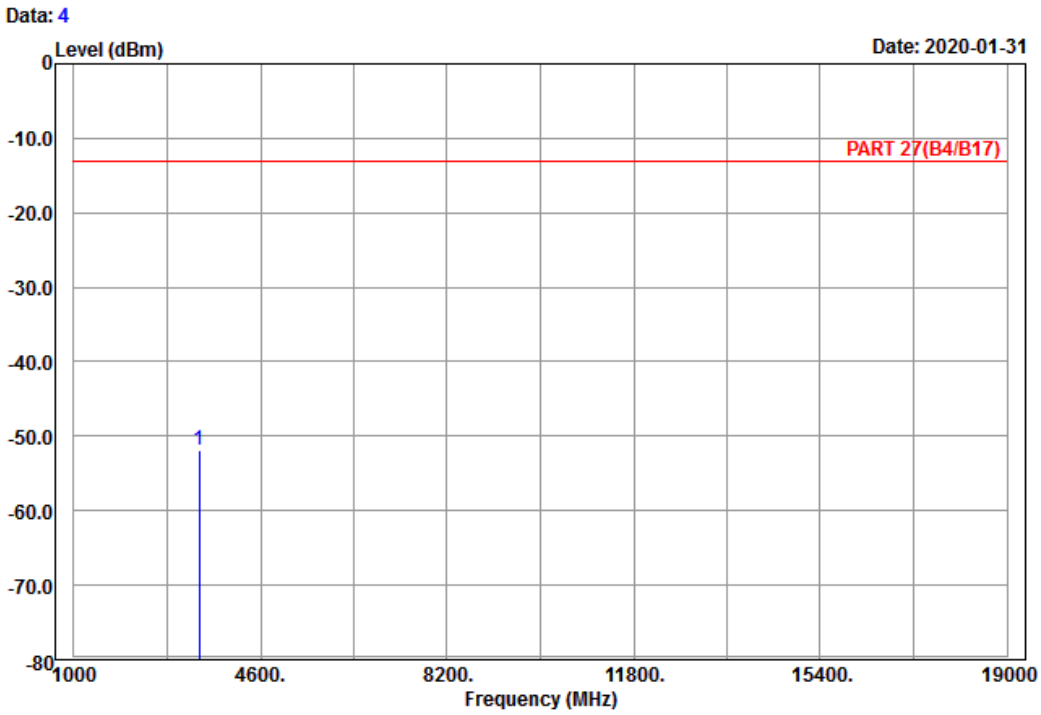
Channel Bandwidth: 5 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3425.00	-49.26	-63.63	-13.00	-36.26	14.37	Peak
2 pp	5137.50	-46.54	-66.35	-13.00	-33.54	19.81	Peak

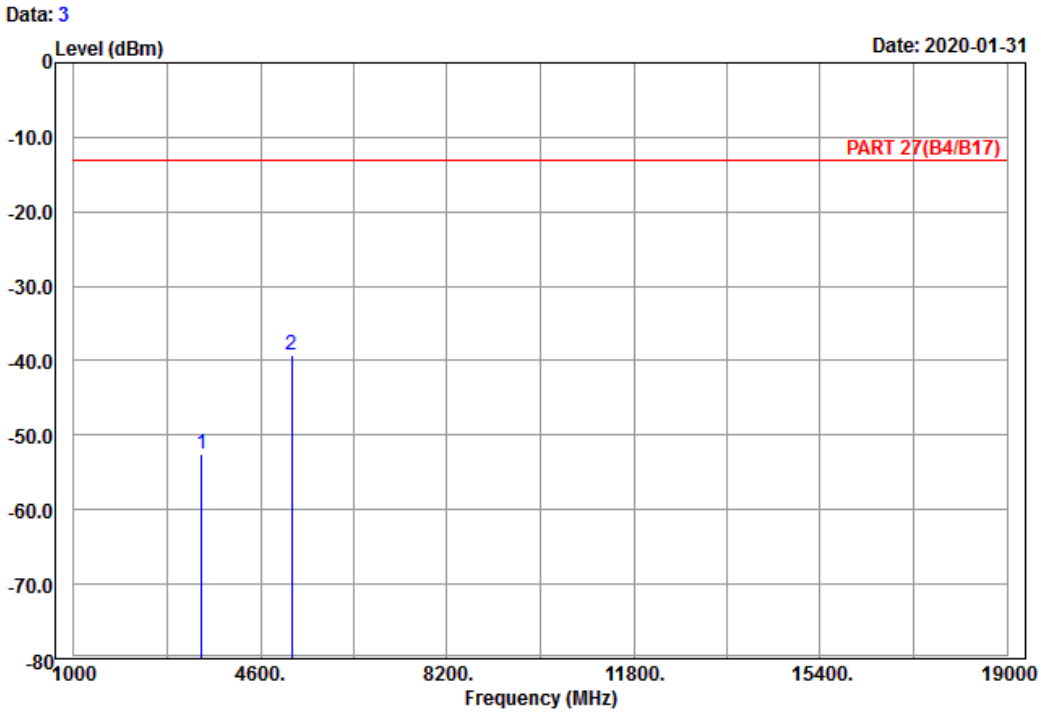


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3425.00	-51.81	-66.18	-13.00	-38.81	14.37	Peak

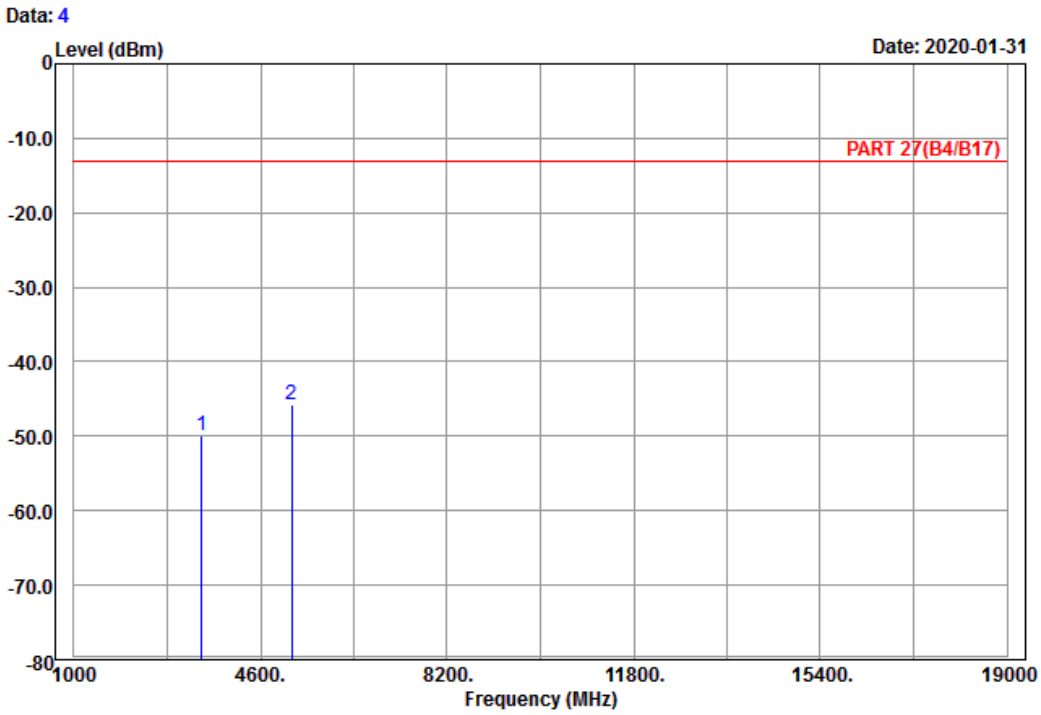
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-52.45	-66.79	-13.00	-39.45	14.34	Peak
2 pp	5197.50	-39.34	-59.46	-13.00	-26.34	20.12	Peak

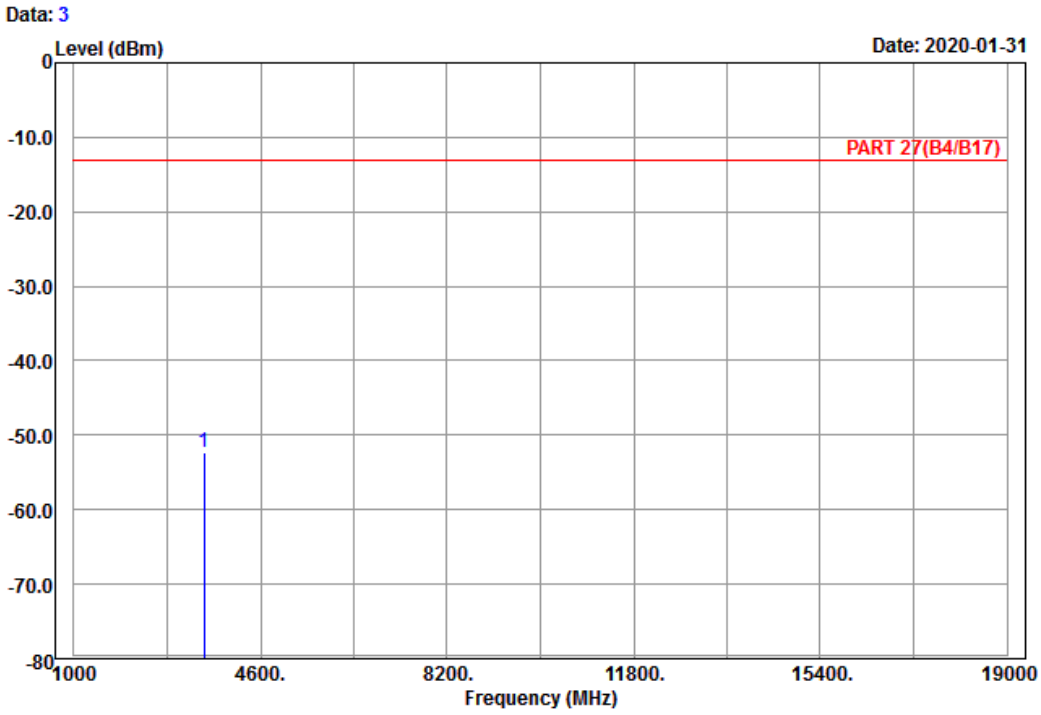


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3465.00	-49.92	-64.26	-13.00	-36.92	14.34	Peak
2 pp	5197.50	-45.72	-65.84	-13.00	-32.72	20.12	Peak

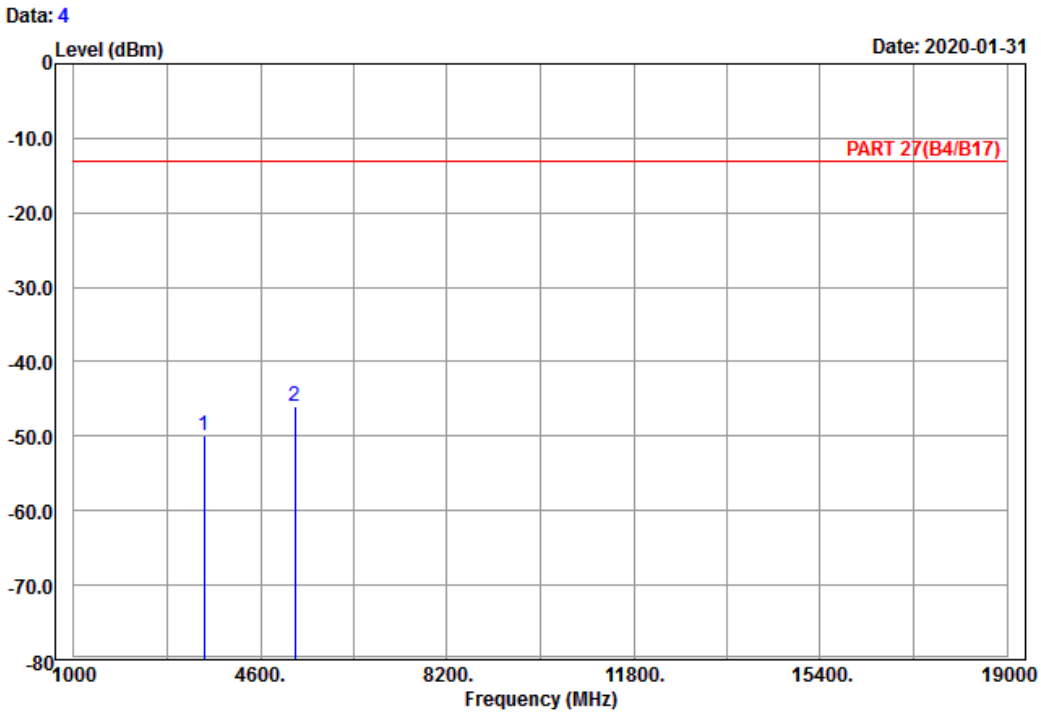
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3505.00	-52.25	-66.53	-13.00	-39.25	14.28	Peak

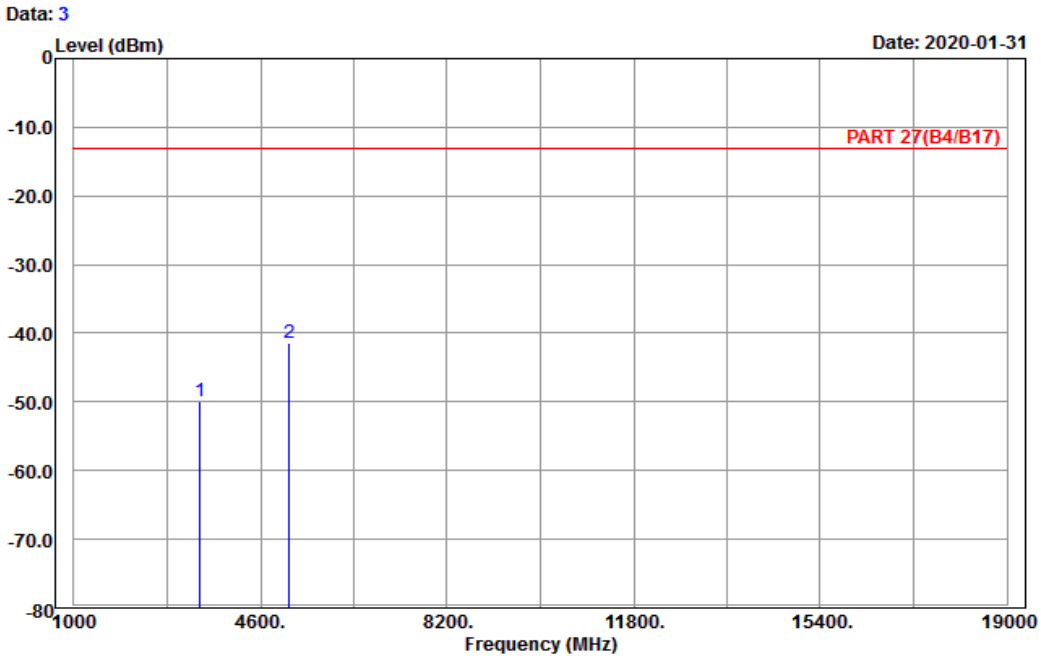


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3505.00	-49.88	-64.16	-13.00	-36.88	14.28	Peak
2 pp	5257.50	-46.01	-66.21	-13.00	-33.01	20.20	Peak

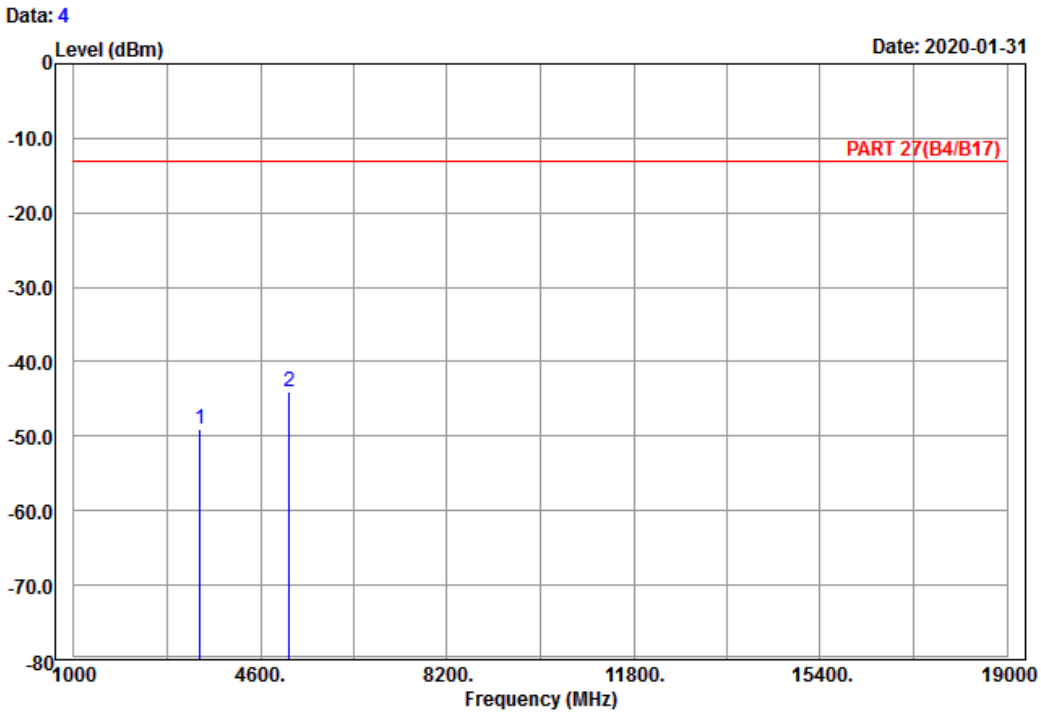
Channel Bandwidth: 20 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3440.00	-49.81	-64.16	-13.00	-36.81	14.35	Peak
2 pp	5160.00	-41.41	-61.33	-13.00	-28.41	19.92	Peak

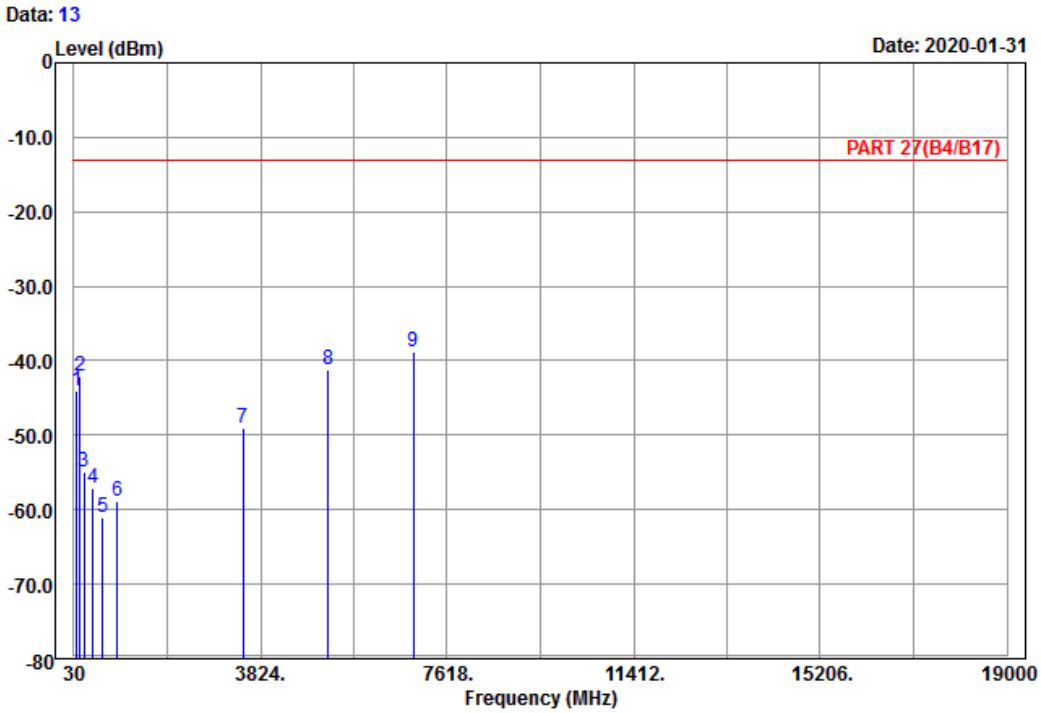


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3440.00	-49.13	-63.48	-13.00	-36.13	14.35	Peak
2 pp	5160.00	-44.09	-64.01	-13.00	-31.09	19.92	Peak

Middle Channel

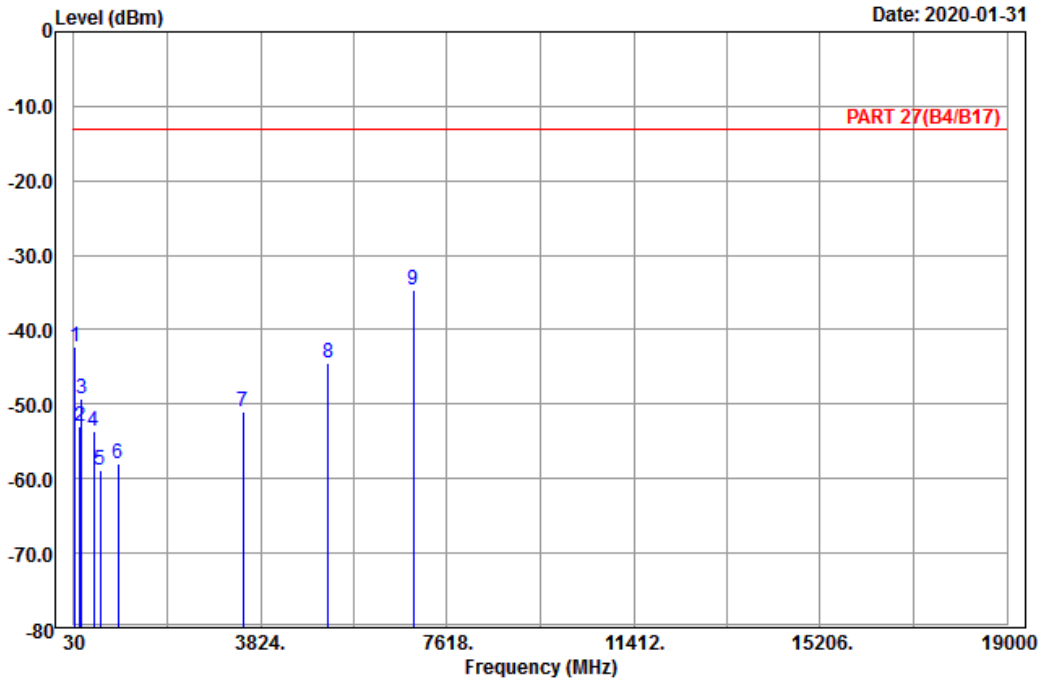
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	85.08	-43.96	-32.74	-13.00	-30.96	-11.22	Peak
2	149.07	-42.11	-34.18	-13.00	-29.11	-7.93	Peak
3	233.04	-55.01	-49.27	-13.00	-42.01	-5.74	Peak
4	418.30	-57.16	-54.02	-13.00	-44.16	-3.14	Peak
5	622.00	-60.95	-61.13	-13.00	-47.95	0.18	Peak
6	911.80	-58.80	-62.21	-13.00	-45.80	3.41	Peak
7	3465.00	-49.14	-63.48	-13.00	-36.14	14.34	Peak
8	5197.50	-41.27	-61.39	-13.00	-28.27	20.12	Peak
9 pp	6930.00	-38.79	-61.66	-13.00	-25.79	22.87	Peak

Data: 14

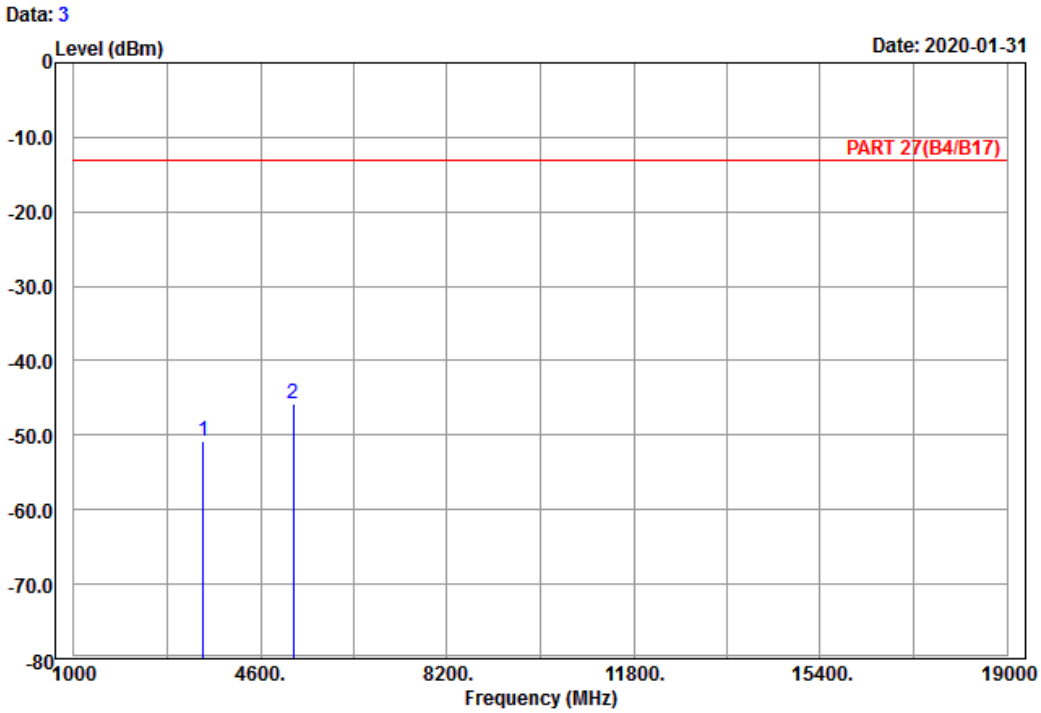


Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	58.89	-42.26	-28.20	-13.00	-29.26	-14.06	Peak
2	148.80	-52.96	-45.06	-13.00	-39.96	-7.90	Peak
3	192.27	-49.26	-43.44	-13.00	-36.26	-5.82	Peak
4	439.30	-53.52	-49.91	-13.00	-40.52	-3.61	Peak
5	571.60	-58.94	-58.16	-13.00	-45.94	-0.78	Peak
6	930.00	-58.09	-62.33	-13.00	-45.09	4.24	Peak
7	3465.00	-51.02	-65.36	-13.00	-38.02	14.34	Peak
8	5197.50	-44.44	-64.56	-13.00	-31.44	20.12	Peak
9 pp	6930.00	-34.61	-57.48	-13.00	-21.61	22.87	Peak

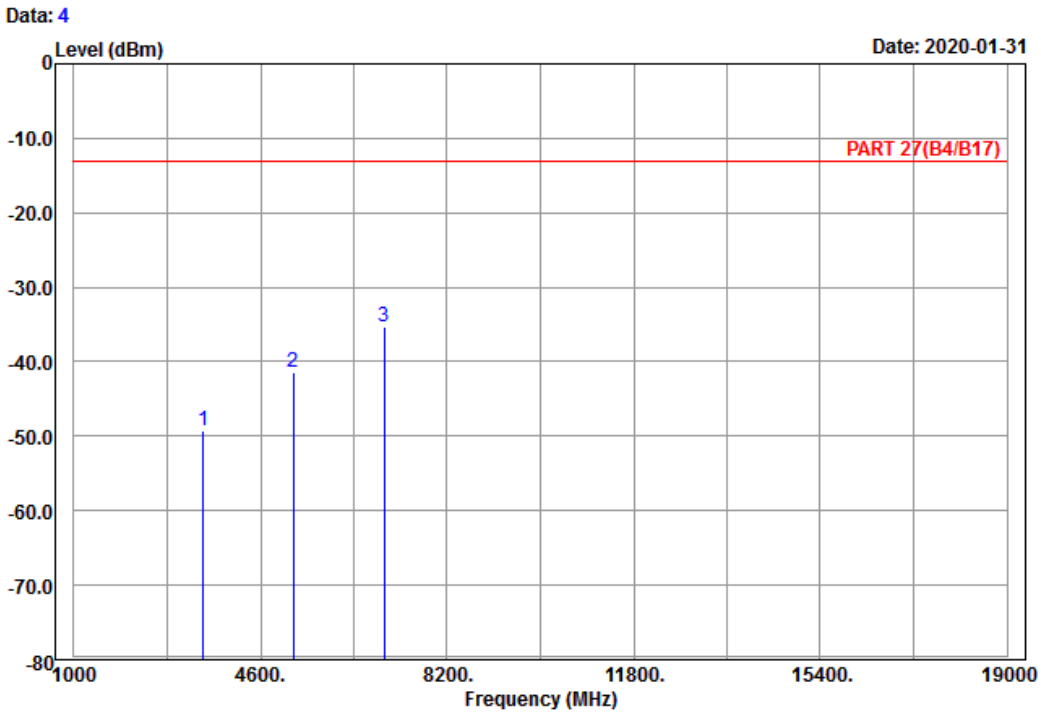
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B4/B17) Horizontal
Remark : LTE_Band 4_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3490.00	-50.80	-65.11	-13.00	-37.80	14.31	Peak
2 pp	5235.00	-45.70	-65.86	-13.00	-32.70	20.16	Peak



Site : 966 chamber 1
Condition: PART 27(B4/B17) Vertical
Remark : LTE_Band 4_Link_H-Ch
Tested by: Karl Lee

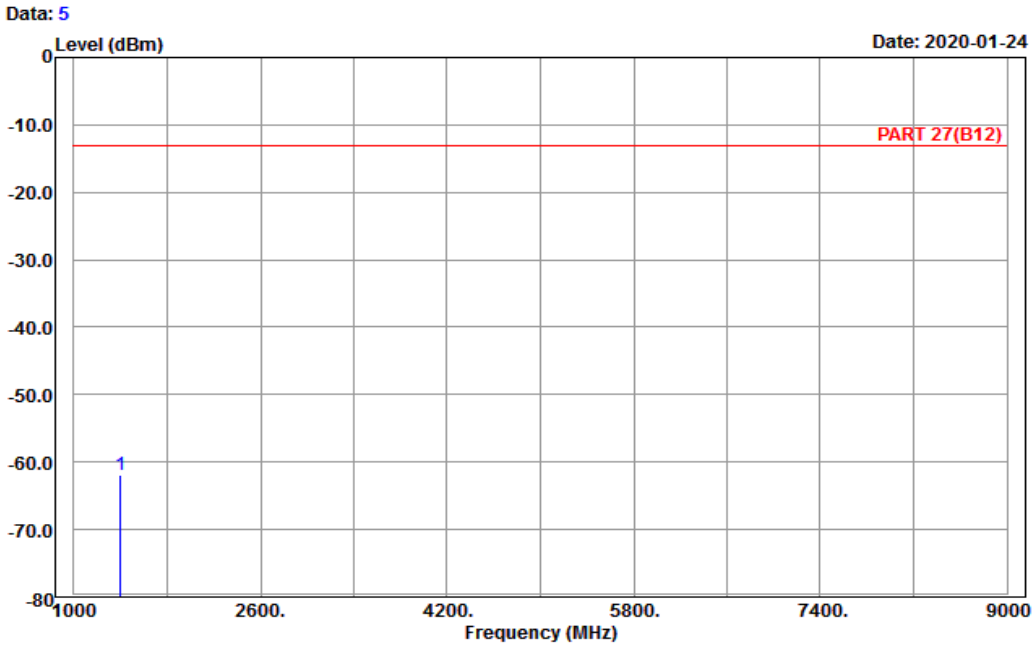
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3490.00	-49.29	-63.60	-13.00	-36.29	14.31	Peak
2	5235.00	-41.46	-61.62	-13.00	-28.46	20.16	Peak
3 pp	6980.00	-35.29	-57.98	-13.00	-22.29	22.69	Peak

LTE Band 12

Channel Bandwidth: 1.4 MHz / QPSK

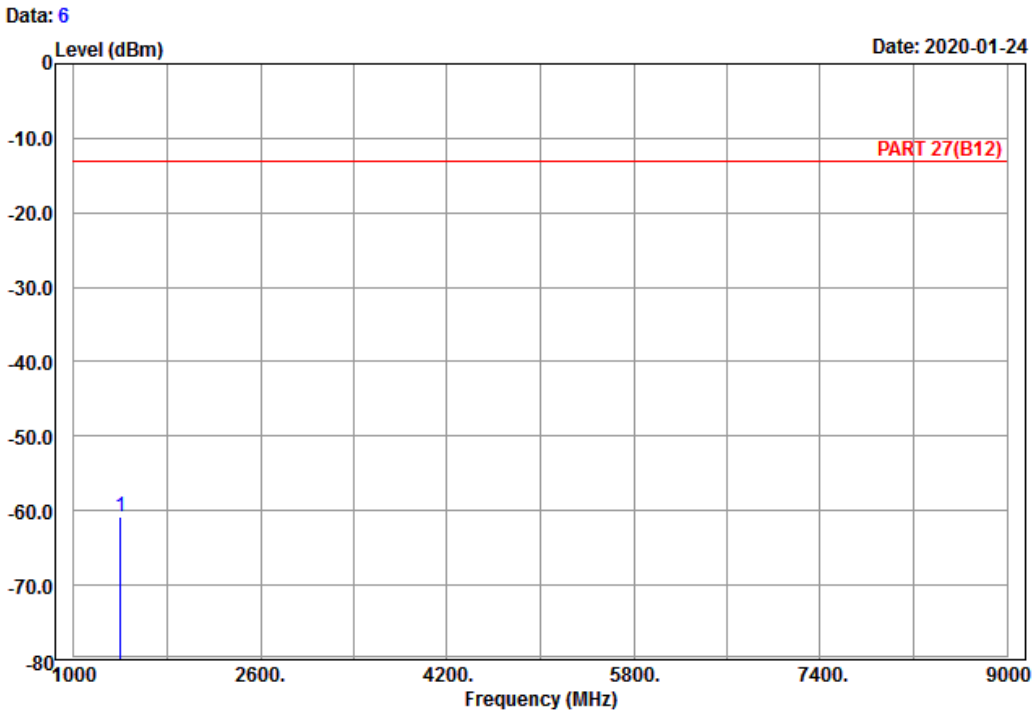
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




```
Site      : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark    : LTE_Band 12_Link_L-Ch
Tested by: Karl Lee
                        Read  Limit   Over
           Freq  Level  Level   Line  Limit Factor Remark
        _________ ______ ______ ______ ______ ______ __________
              MHz    dBm    dBm    dBm     dB     dB

  1 pp  1399.40 -62.01 -68.11 -13.00 -49.01   6.10 Peak
```

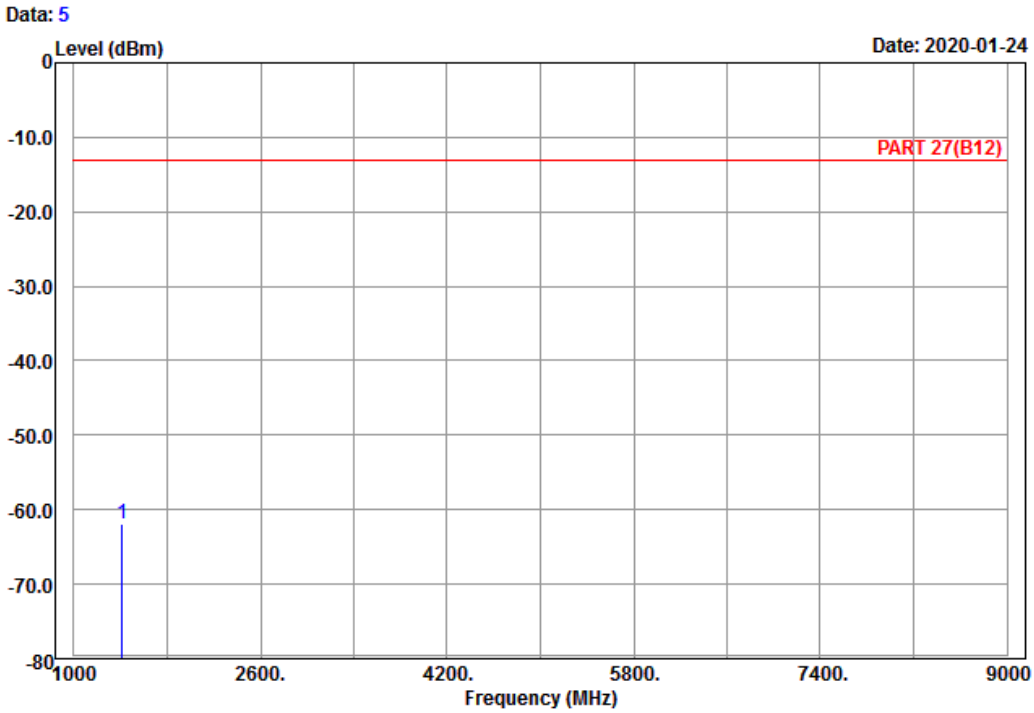


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1399.40	-60.90	-67.00	-13.00	-47.90	6.10	Peak

Middle Channel

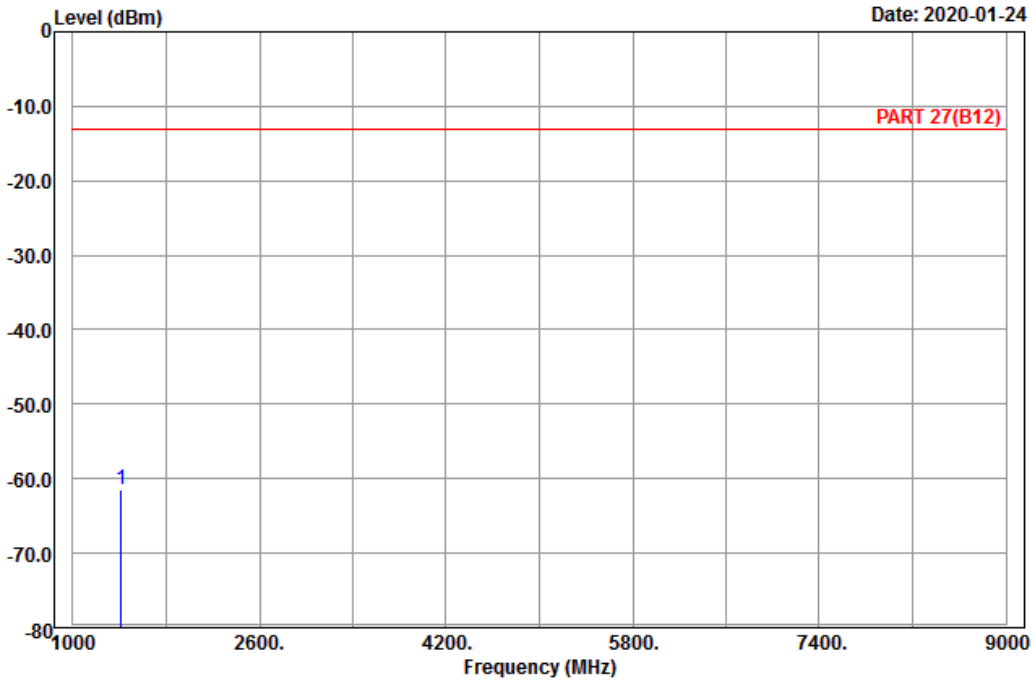
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1415.00	-61.81	-68.17	-13.00	-48.81	6.36	Peak

Data: 6

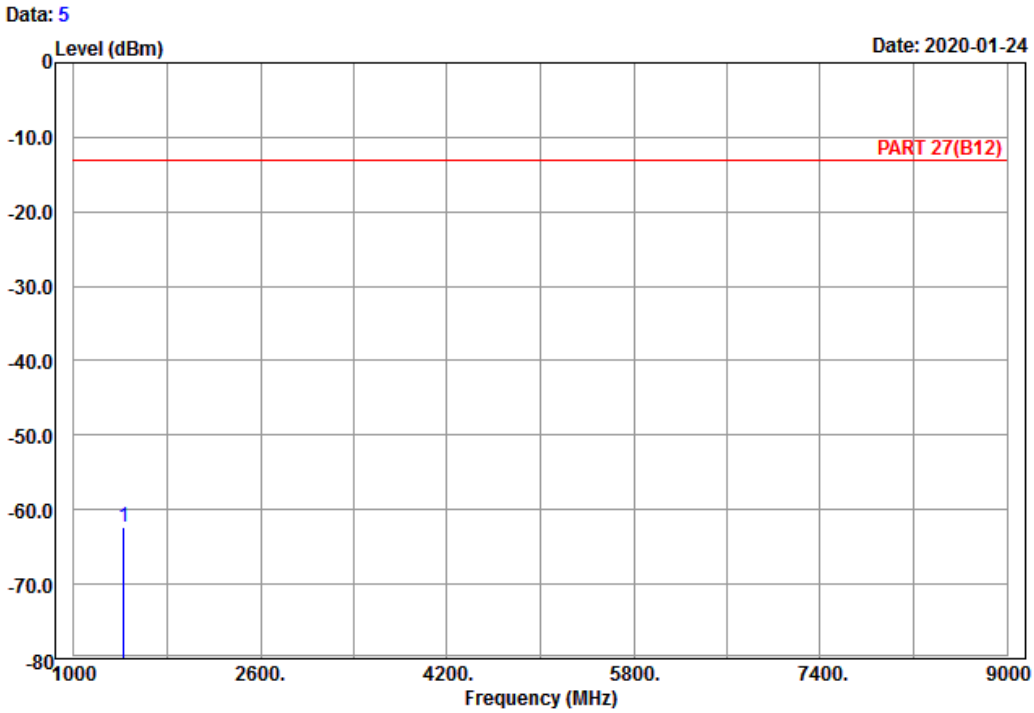


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1415.00	-61.46	-67.82	-13.00	-48.46	6.36	Peak

High Channel

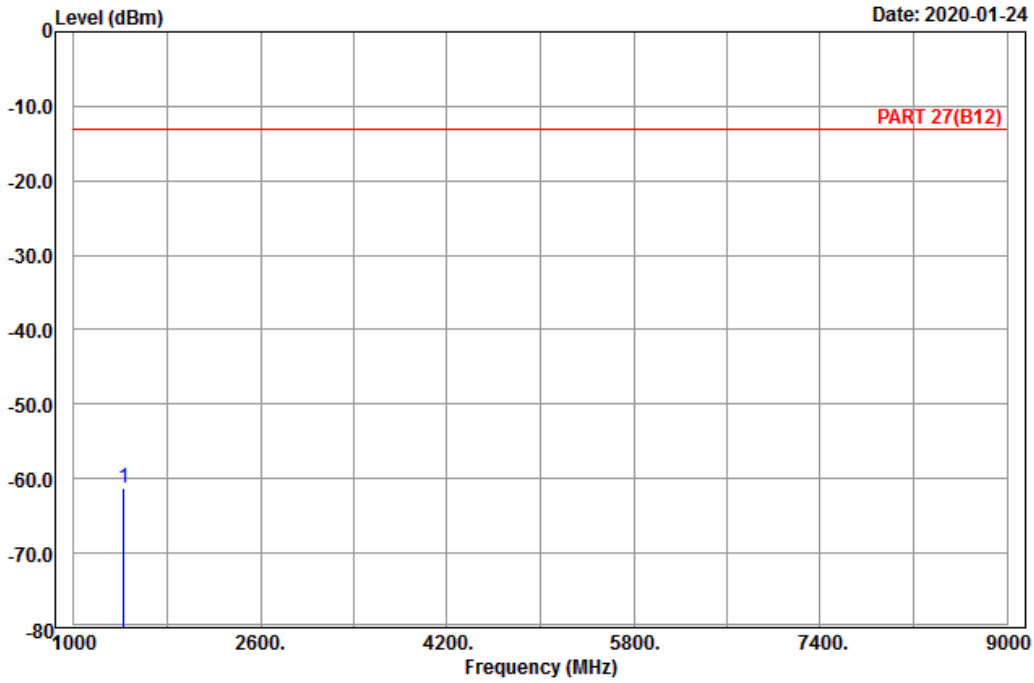
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1430.60	-62.26	-68.50	-13.00	-49.26	6.24	Peak

Data: 6

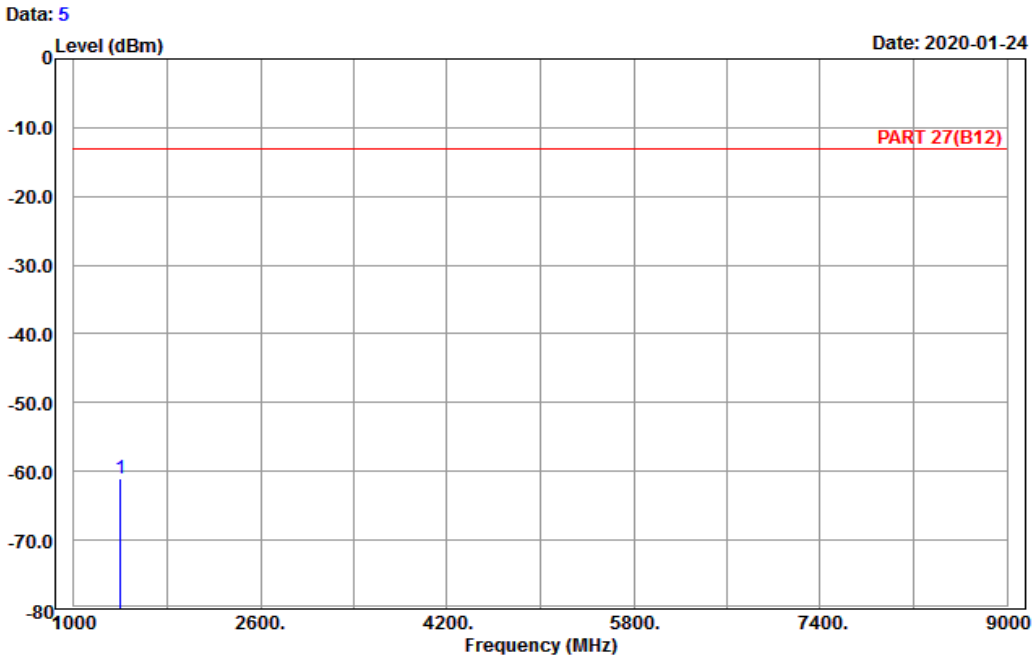


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1430.60	-61.20	-67.44	-13.00	-48.20	6.24	Peak

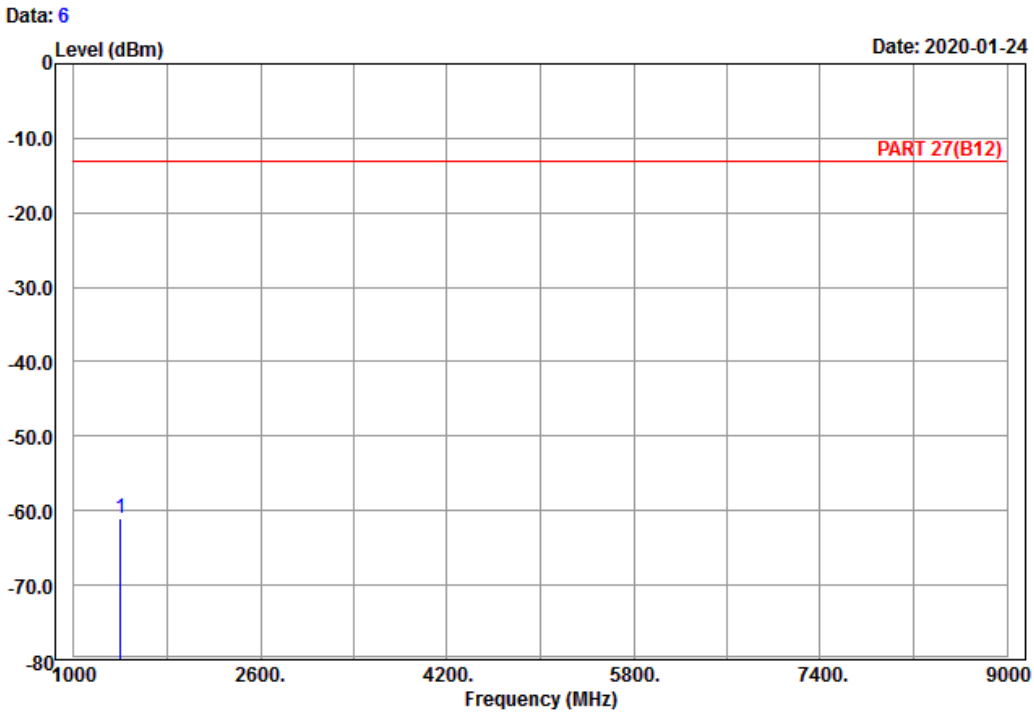
Channel Bandwidth: 5 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1403.00	-61.13	-67.23	-13.00	-48.13	6.10	Peak

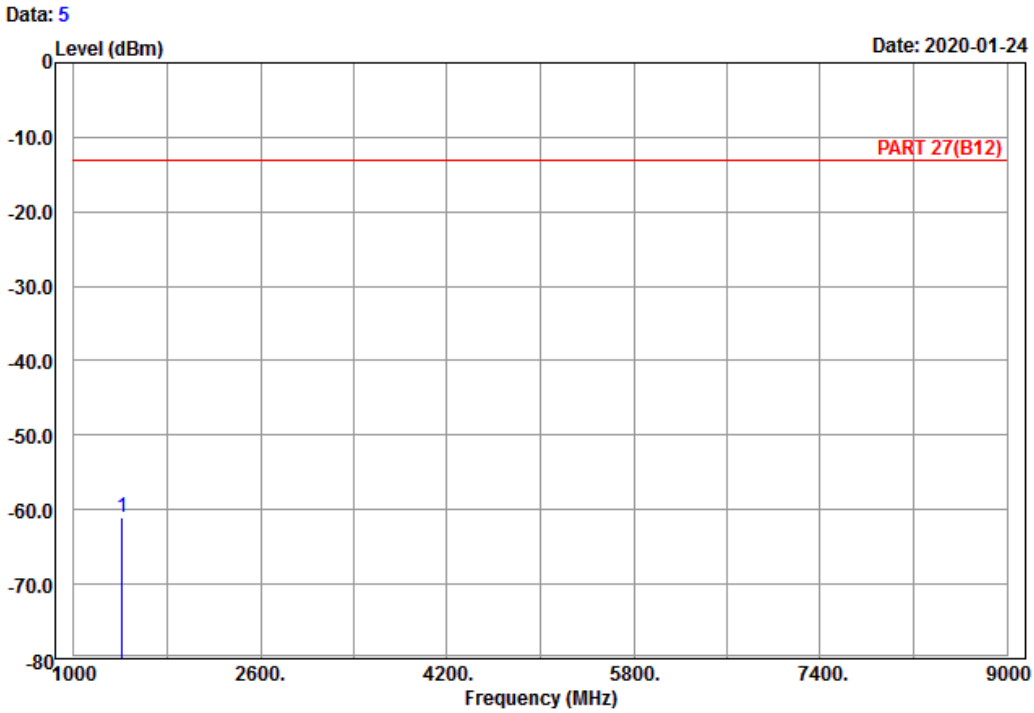


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1403.00	-60.94	-67.04	-13.00	-47.94	6.10	Peak

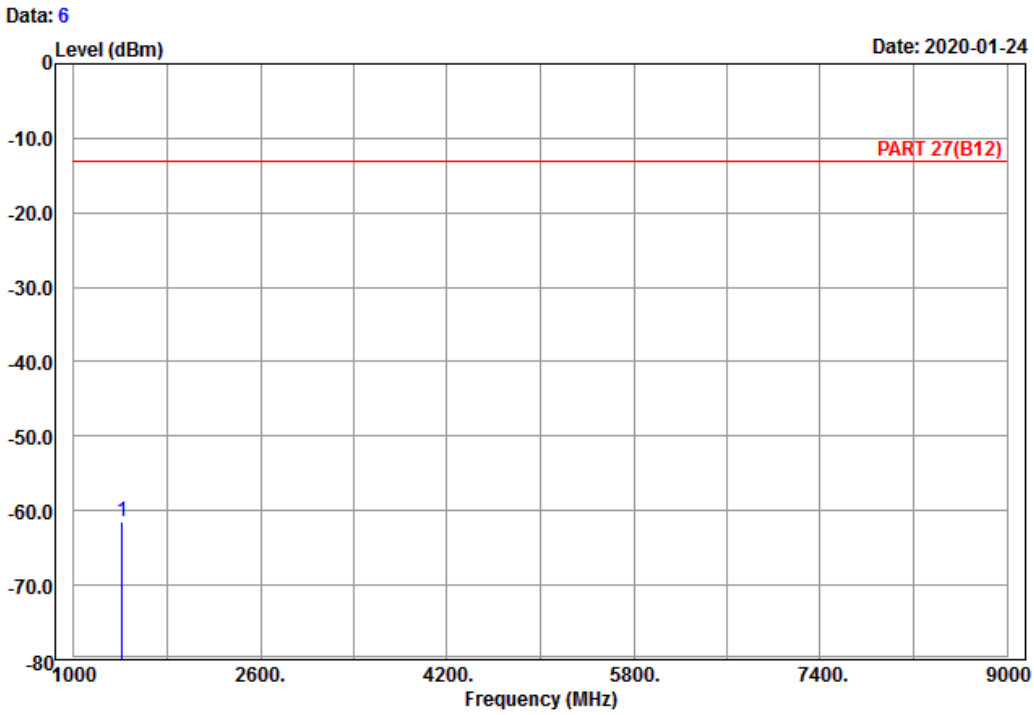
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1415.00	-60.95	-67.31	-13.00	-47.95	6.36	Peak

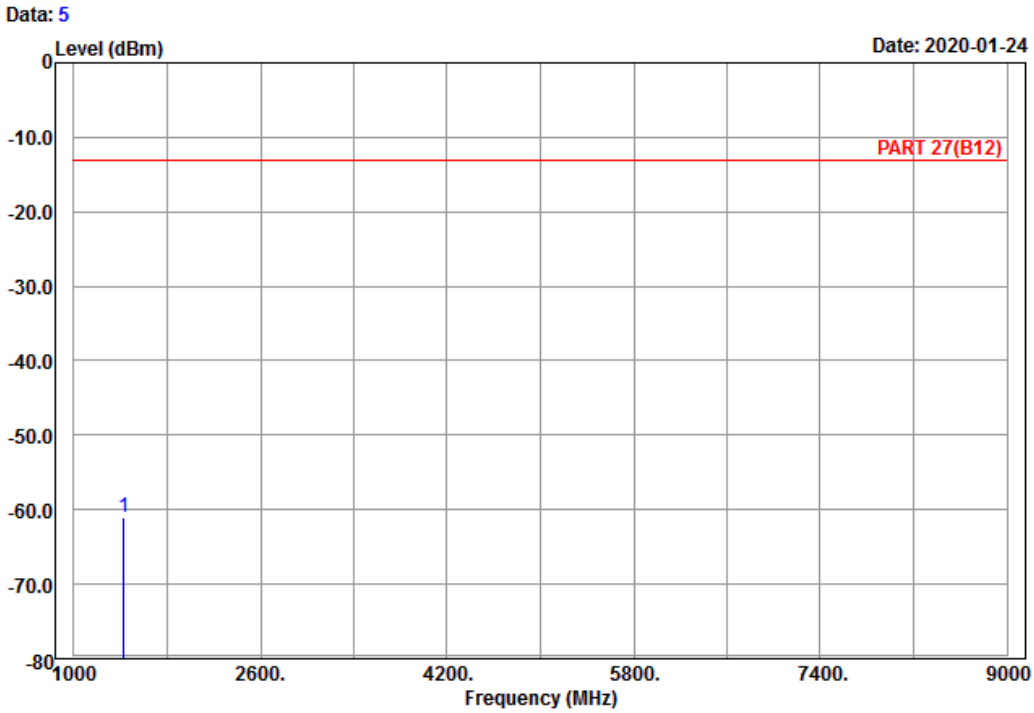


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1415.00	-61.47	-67.83	-13.00	-48.47	6.36	Peak

High Channel

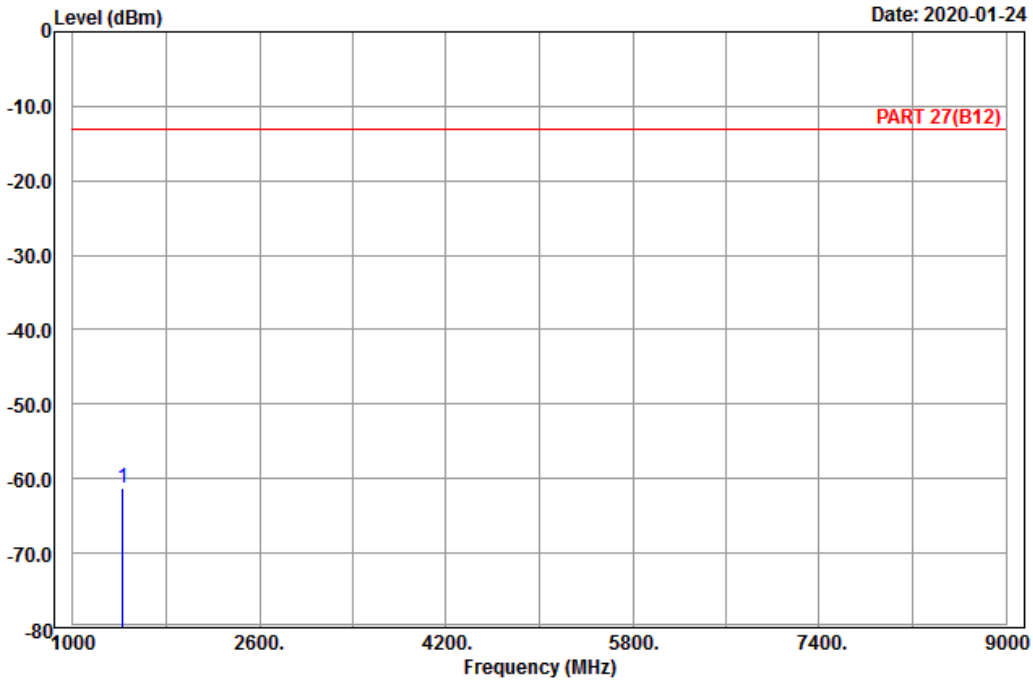
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1427.00	-61.01	-67.25	-13.00	-48.01	6.24	Peak

Data: 6

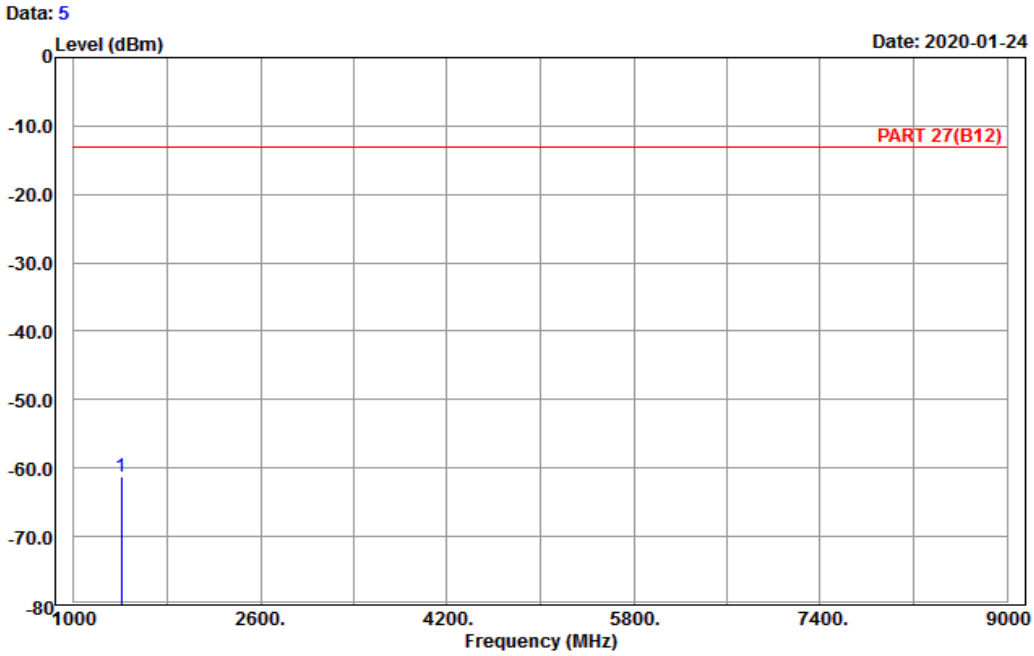


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1427.00	-61.36	-67.60	-13.00	-48.36	6.24	Peak

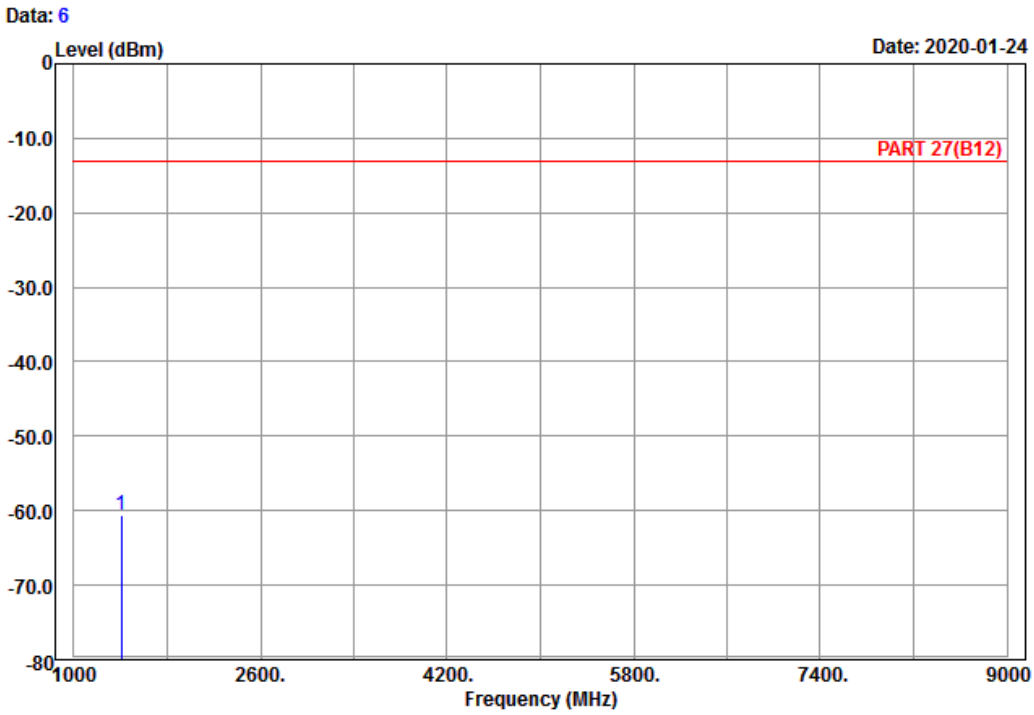
Channel Bandwidth: 10 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1408.00	-61.35	-67.71	-13.00	-48.35	6.36	Peak

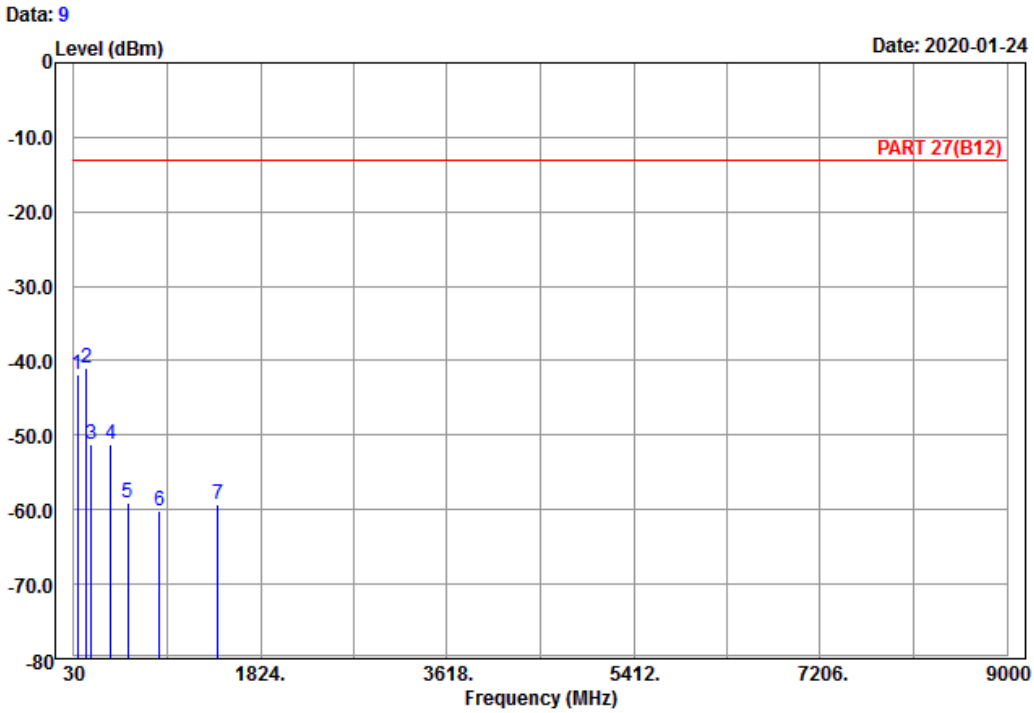


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1408.00	-60.54	-66.90	-13.00	-47.54	6.36	Peak

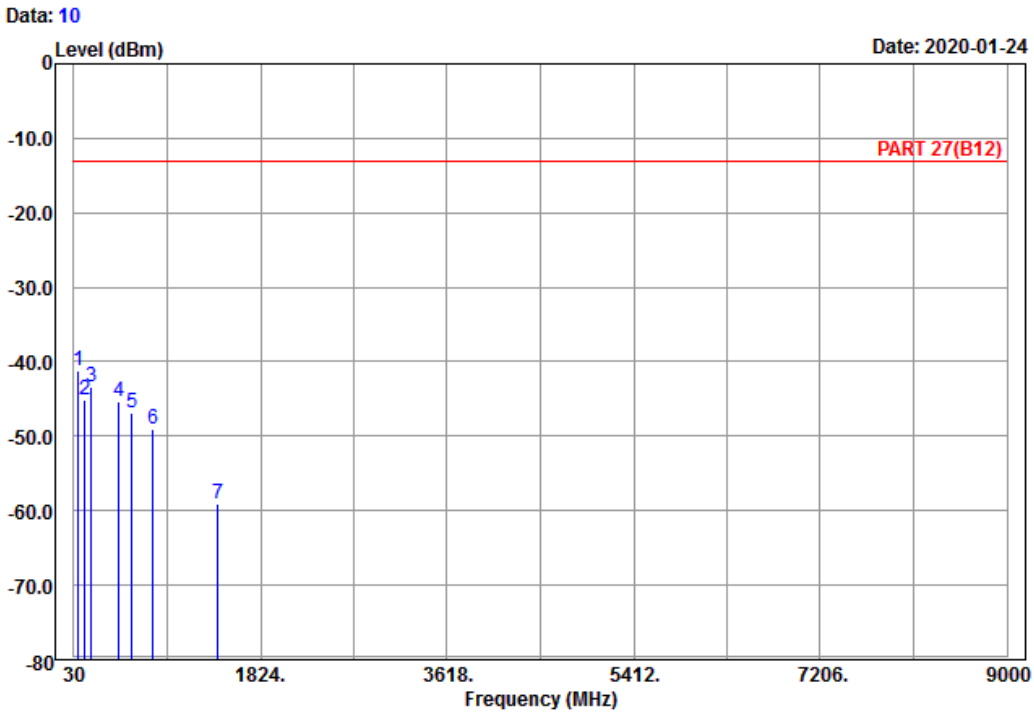
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	62.40	-41.89	-28.10	-13.00	-28.89	-13.79	Peak
2 pp	149.61	-40.95	-33.02	-13.00	-27.95	-7.93	Peak
3	196.32	-51.12	-45.12	-13.00	-38.12	-6.00	Peak
4	382.60	-51.19	-47.57	-13.00	-38.19	-3.62	Peak
5	552.00	-59.10	-57.52	-13.00	-46.10	-1.58	Peak
6	852.30	-60.20	-61.73	-13.00	-47.20	1.53	Peak
7	1415.00	-59.34	-65.70	-13.00	-46.34	6.36	Peak

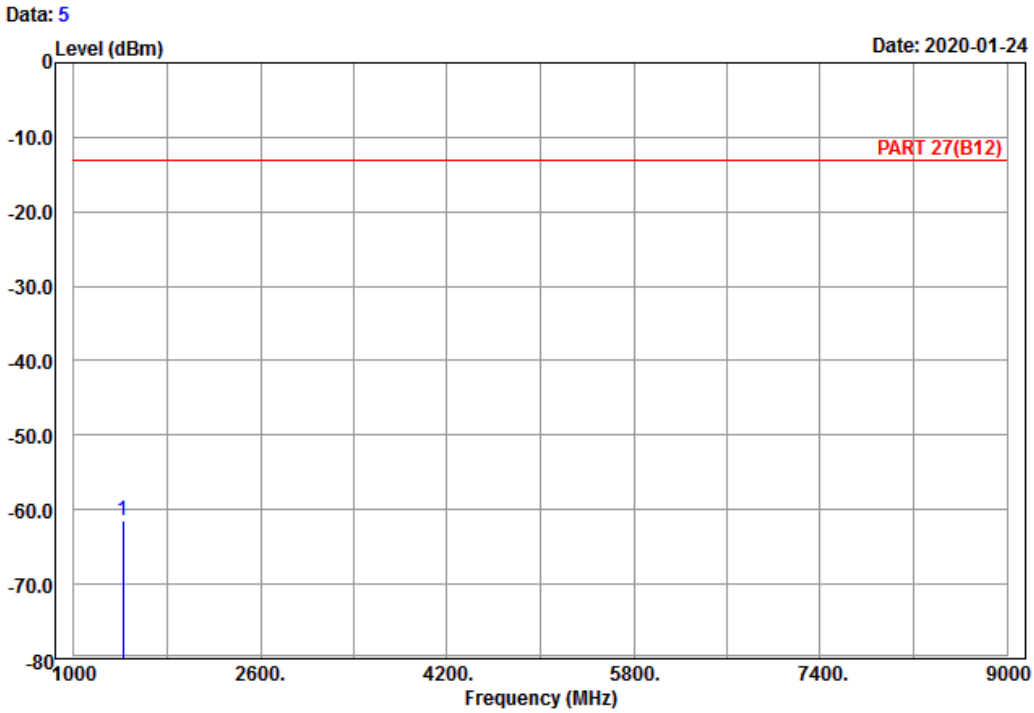


Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	74.82	-41.23	-28.96	-13.00	-28.23	-12.27	Peak
2	137.19	-45.21	-37.53	-13.00	-32.21	-7.68	Peak
3	194.43	-43.30	-37.34	-13.00	-30.30	-5.96	Peak
4	463.80	-45.39	-41.16	-13.00	-32.39	-4.23	Peak
5	587.00	-46.80	-46.66	-13.00	-33.80	-0.14	Peak
6	787.90	-49.06	-50.24	-13.00	-36.06	1.18	Peak
7	1415.00	-59.16	-65.52	-13.00	-46.16	6.36	Peak

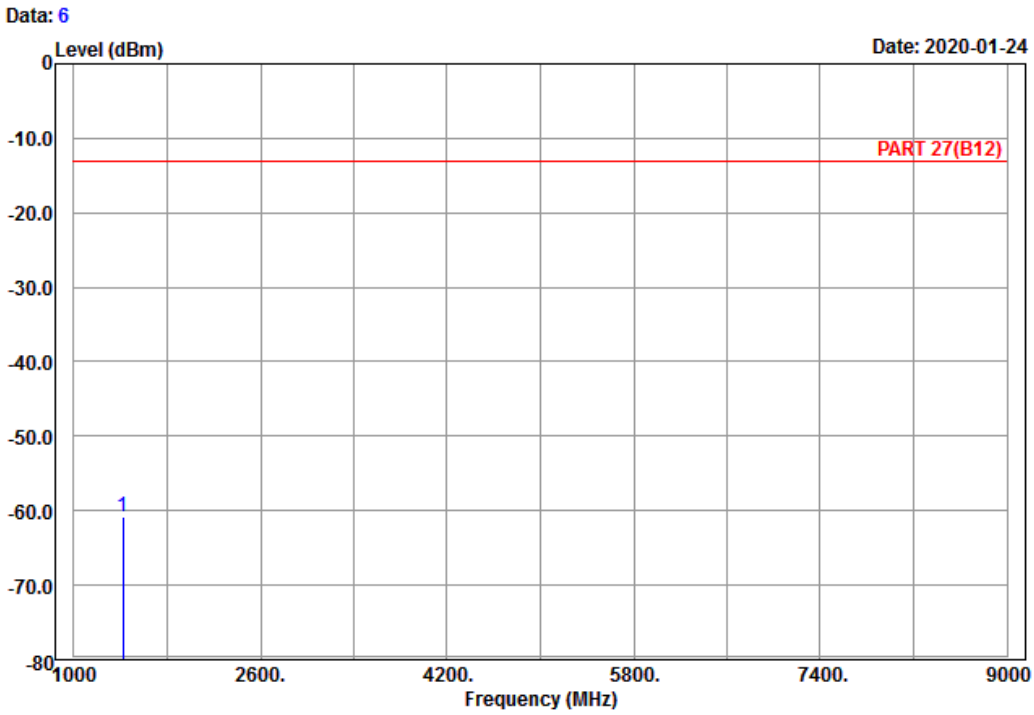
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B12) Horizontal
Remark : LTE_Band 12_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1422.00	-61.48	-67.84	-13.00	-48.48	6.36	Peak



Site : 966 chamber 1
Condition: PART 27(B12) Vertical
Remark : LTE_Band 12_Link_H-Ch
Tested by: Karl Lee

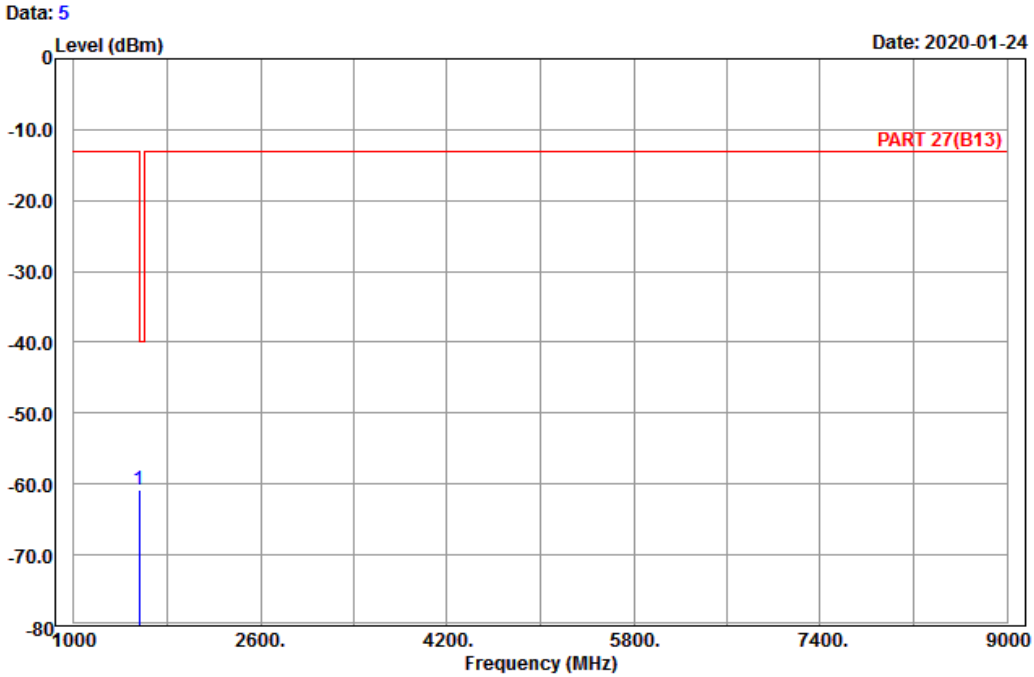
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1422.00	-60.84	-67.20	-13.00	-47.84	6.36	Peak

LTE Band 13

Channel Bandwidth: 5 MHz / QPSK

Low Channel

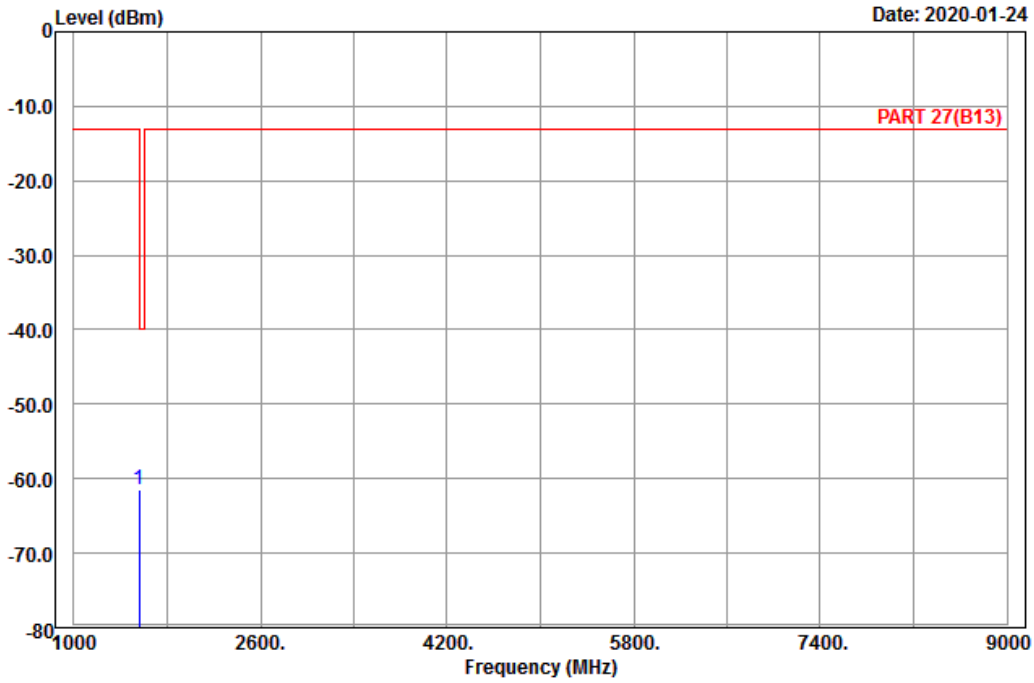
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




```
Site      : 966 chamber 1
Condition: PART 27(B13) Horizontal
Remark    : LTE_Band 13_Link_L-Ch
Tested by: Karl Lee
                        Read  Limit   Over
           Freq  Level  Level   Line  Limit Factor Remark
        _________ ______ ______ ______ ______ ______ ________
              MHz    dBm    dBm    dBm     dB     dB

  1 pp  1559.00 -60.80 -67.66 -40.00 -20.80   6.86 Peak
```

Data: 6

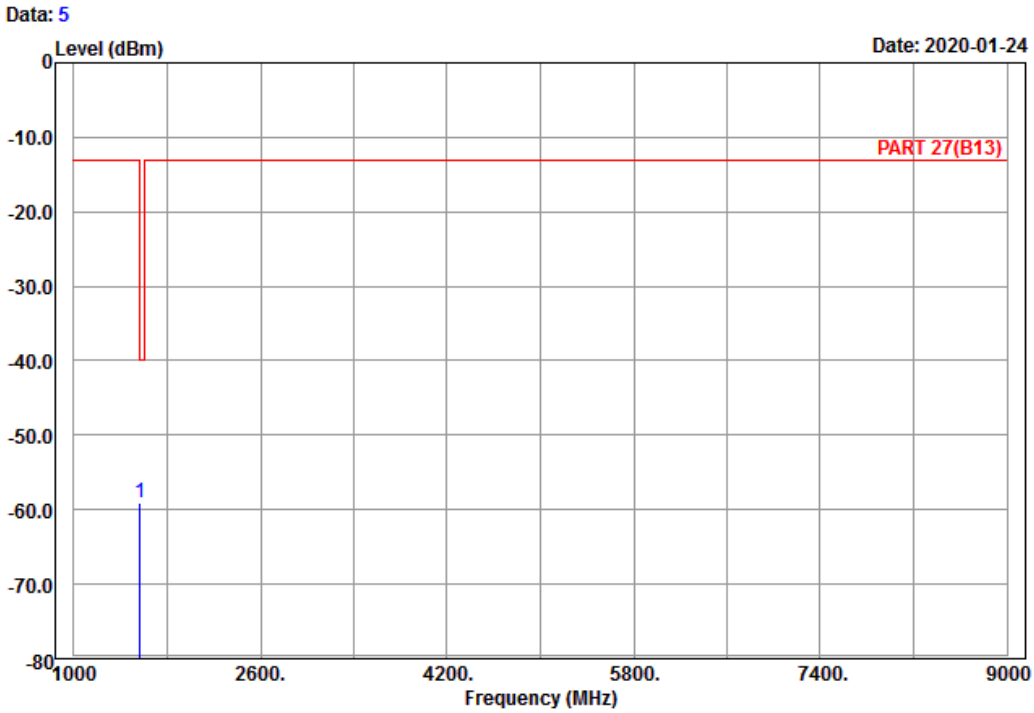


Site : 966 chamber 1
Condition: PART 27(B13) Vertical
Remark : LTE_Band 13_Link_L-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1559.00	-61.46	-68.32	-40.00	-21.46	6.86	Peak

Middle Channel

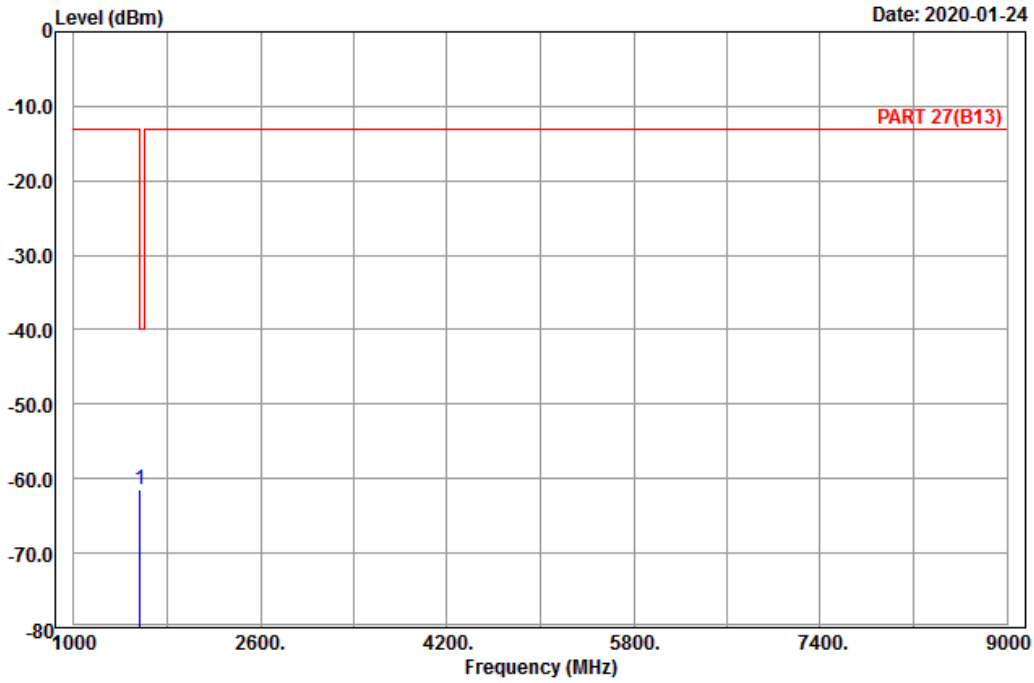
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B13) Horizontal
Remark : LTE_Band 13_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-59.18	-66.04	-40.00	-19.18	6.86	Peak

Data: 6

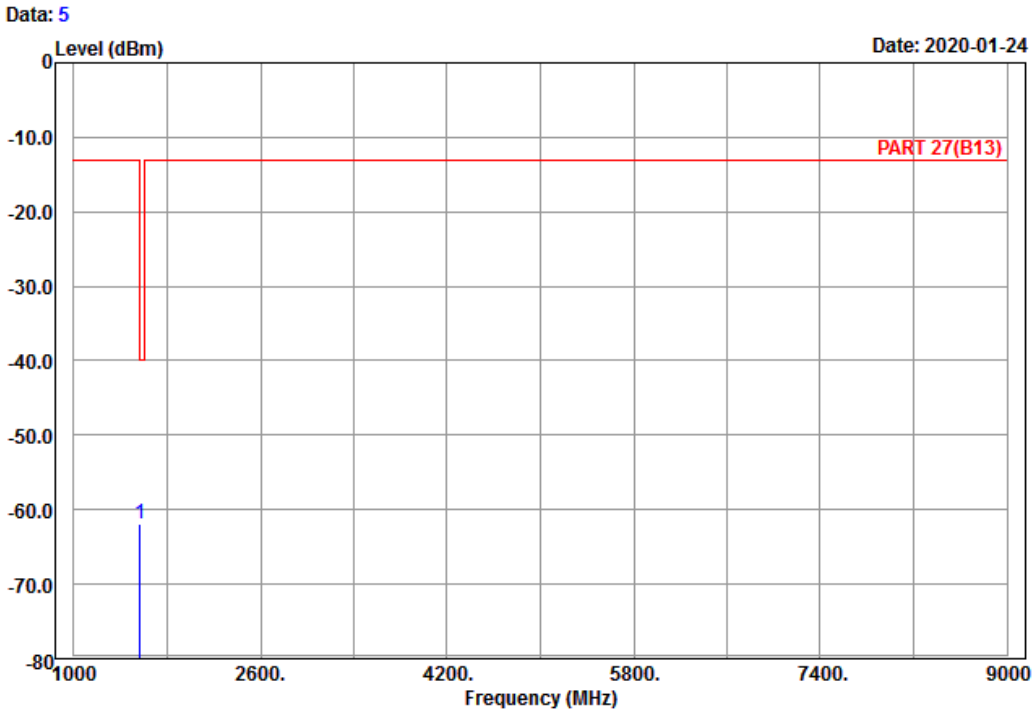


Site : 966 chamber 1
Condition: PART 27(B13) Vertical
Remark : LTE_Band 13_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1564.00	-61.45	-68.31	-40.00	-21.45	6.86	Peak

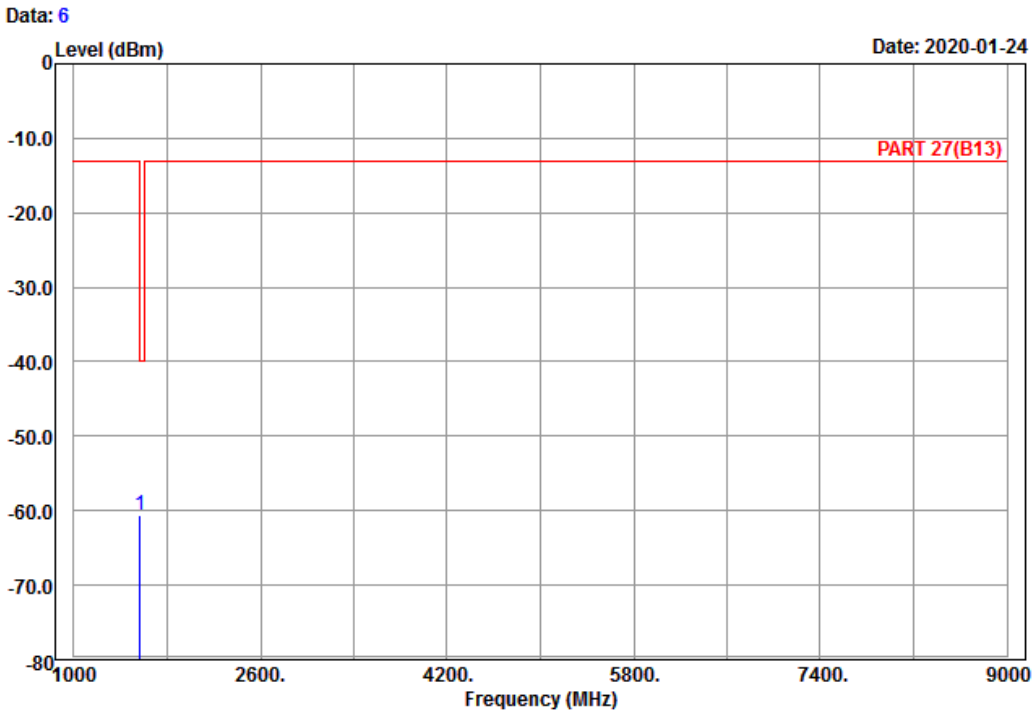
High Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B13) Horizontal
Remark : LTE_Band 13_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-61.90	-68.94	-40.00	-21.90	7.04	Peak

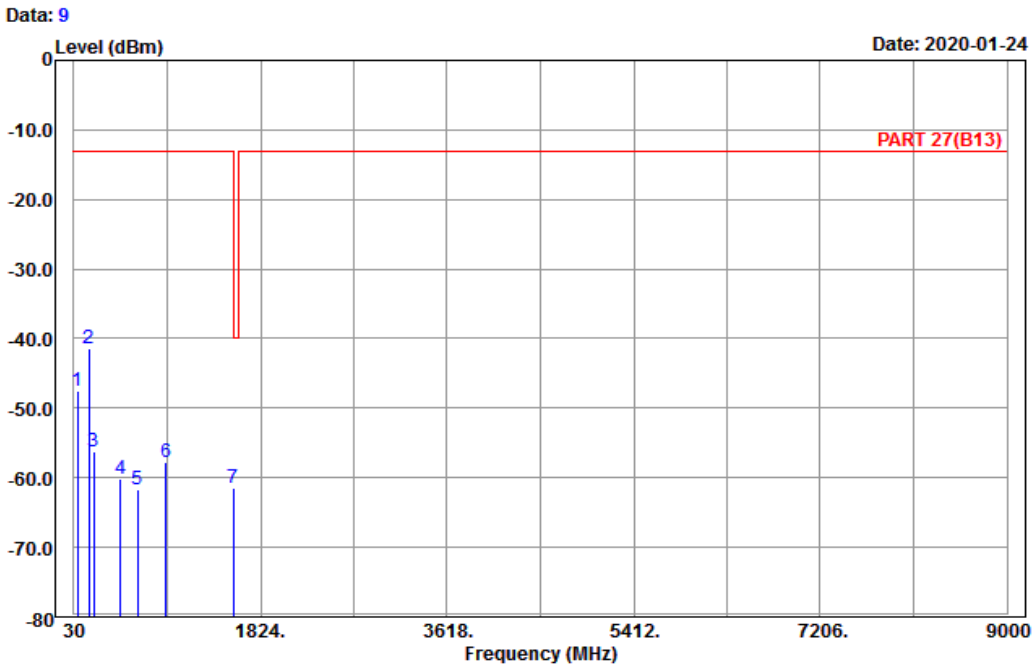


Site : 966 chamber 1
Condition: PART 27(B13) Vertical
Remark : LTE_Band 13_Link_H-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1569.00	-60.57	-67.61	-40.00	-20.57	7.04	Peak

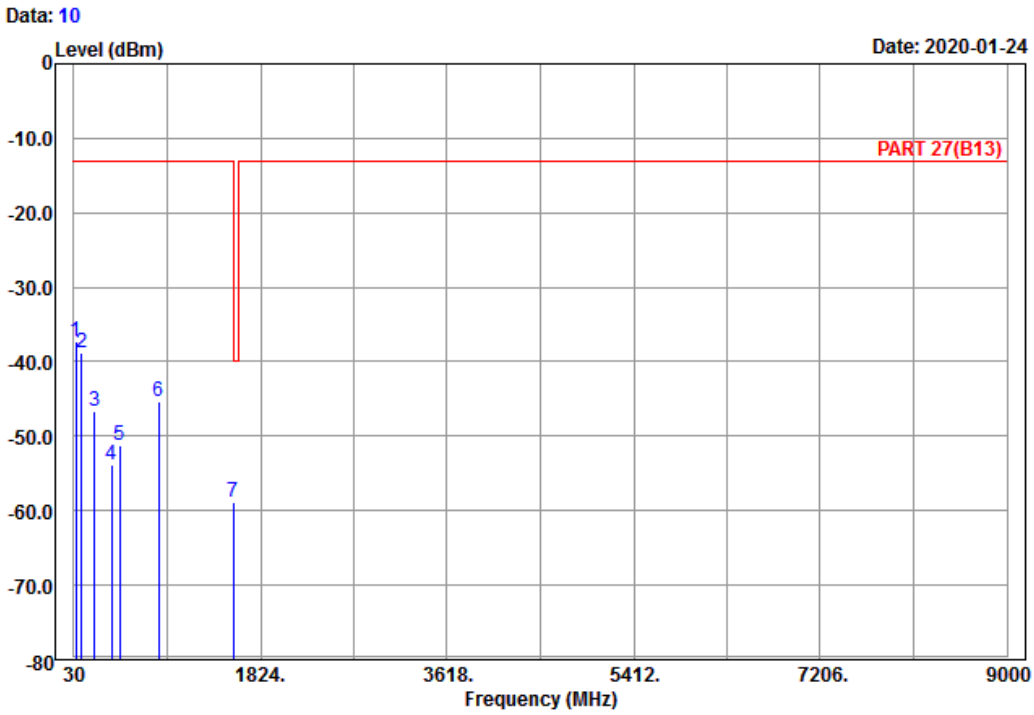
Channel Bandwidth: 10 MHz / QPSK
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 27(B13) Horizontal
Remark : LTE_Band 13_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	66.72	-47.44	-34.34	-13.00	-34.44	-13.10	Peak
2	177.42	-41.43	-35.55	-13.00	-28.43	-5.88	Peak
3	222.78	-56.35	-50.48	-13.00	-43.35	-5.87	Peak
4	476.40	-60.07	-55.48	-13.00	-47.07	-4.59	Peak
5	639.50	-61.79	-61.78	-13.00	-48.79	-0.01	Peak
6	917.40	-57.69	-61.36	-13.00	-44.69	3.67	Peak
7 pp	1564.00	-61.39	-68.25	-40.00	-21.39	6.86	Peak



Site : 966 chamber 1
Condition: PART 27(B13) Vertical
Remark : LTE_Band 13_Link_M-Ch
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	48.36	-37.31	-23.88	-13.00	-24.31	-13.43	Peak
2	105.06	-38.84	-29.31	-13.00	-25.84	-9.53	Peak
3	230.88	-46.68	-40.91	-13.00	-33.68	-5.77	Peak
4	396.60	-53.89	-50.99	-13.00	-40.89	-2.90	Peak
5	468.00	-51.17	-46.80	-13.00	-38.17	-4.37	Peak
6	842.50	-45.31	-46.84	-13.00	-32.31	1.53	Peak
7 pp	1564.00	-58.90	-65.76	-40.00	-18.90	6.86	Peak

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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